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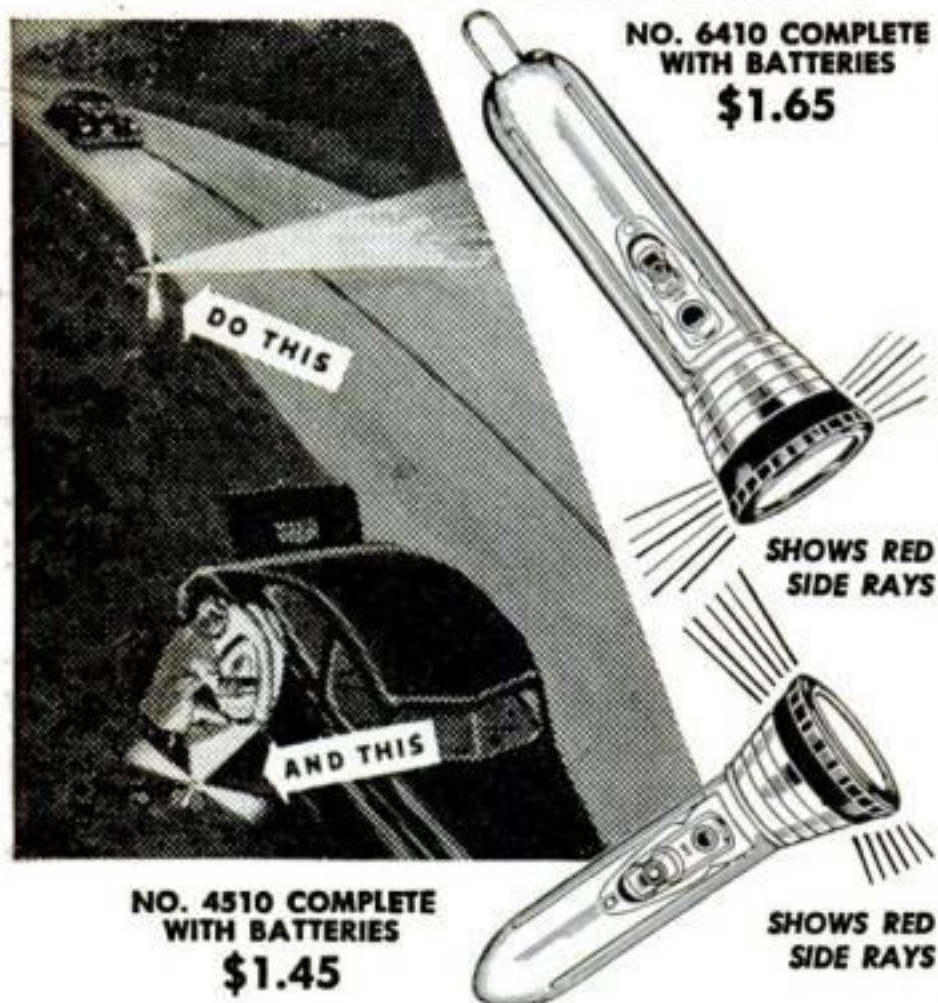
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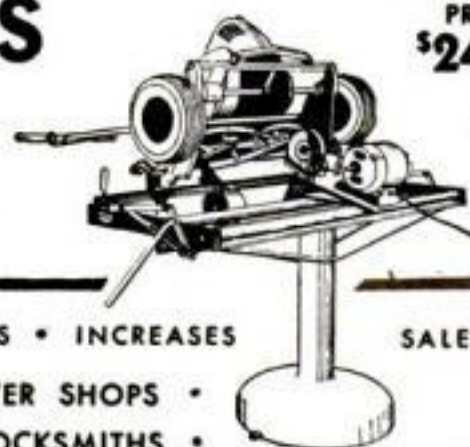
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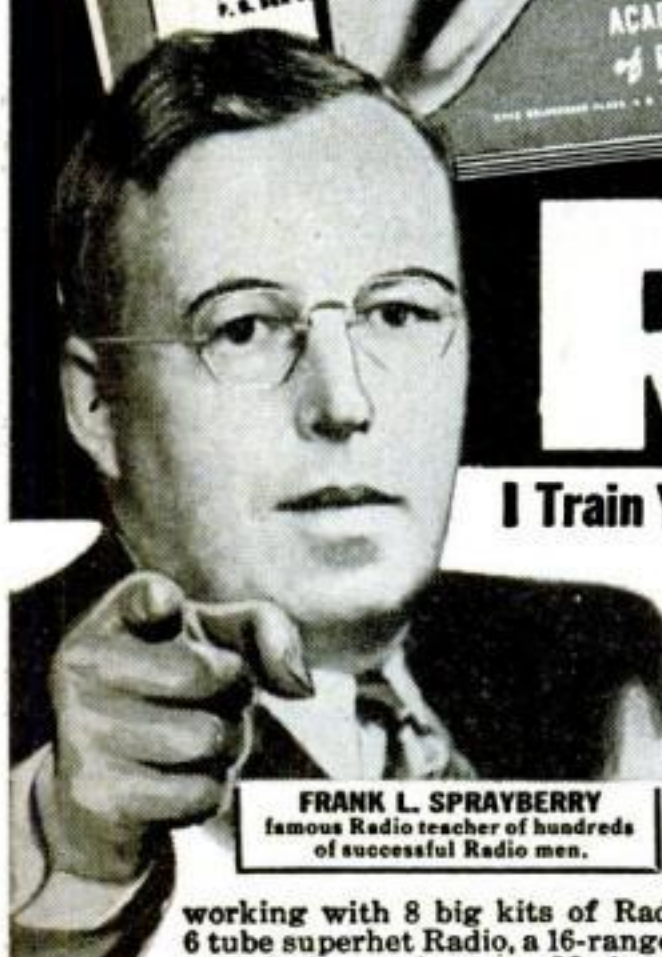
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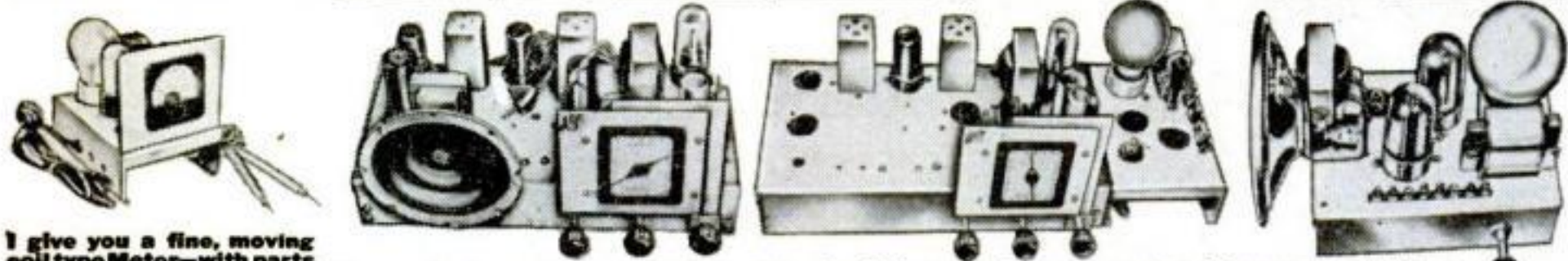
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A patent gives the inventor the exclusive right to prevent others from making, using, or selling the invention claimed in the patent for a period of seventeen years.

The Patent Laws were enacted for the benefit of the inventor to give him protection for the features of his invention which are patentable. These features must be properly and concisely set forth and claimed in a formal application for patent, in order to comply with the requirements of the Patent Laws. For that reason, unless the inventor is familiar with patent matters, he should engage a competent registered patent attorney or agent to represent him. We are registered to practice before the U. S. Patent Office and are prepared to serve you in the handling of your patent matters.

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Letters



Not to Be Outdone

Sir:

In the "Voice of Science" page of the July issue you have an anecdote concerning some Russian engineers who settled a heavy piece of equipment into a hole by placing it on chunks of ice in the hole, allowing the ice to melt and the machine to settle, and then pumping out the water.

American engineers use this procedure as a standard practice, using, however, dry ice, so they won't be bothered by pumping.

L. P. SMITH, JR.

Province Lake, N. H.

Where Is Color Television?

Sir:

Just what stage is color television actually in? Is it ready for the general public?

Will the color television set be limited to color only or will it pick up a black-and-white image?

Will the color set be larger and more complicated to repair?

Will the image of the new color set be of the same standard of clarity as sets now on the market, or will the color tend to soften and diffuse the image?

About what will these sets cost?

OLIVER F. RICHARDS, JR.

St. Louis, Mo.

The Federal Communications Commission decided last year that color television was not yet ready for the public and that commercial color broadcasting should not be permitted at least until 1952.

This ruling climaxed a dispute between RCA and the Columbia Broadcasting System. CBS wanted present television standards changed to permit the use of its mechanical color system (see "Full-Color Television," PS, July '41, p. 65), which it claimed is ready for commercial use now. RCA, which is developing its own all-electronic color system (see "Electronic Color Television is Here," PS, Feb. '47, p. 100), argued that standards should stay as they are to let black-and-white television get going while color is investigated further.

In effect, the FCC backed up RCA's view.

INVENTORS

Patent laws encourage the development of inventions.

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The firm of McMorow, Berman and Davidson is registered to practice before the United States Patent Office. Additionally it engages patent attorneys able to readily understand inventors' disclosures, to advise concerning patentability, and to prepare appropriate specifications and claims.

If an inventor believes he has an invention, a search of the most pertinent prior U. S. patents should be made and a report obtained relative to its patentability. Where such report indicates that the invention appears patentable, in order to secure protection, diligence should be exercised in making application for a patent.

Send for a copy of Patent Booklet entitled "How To Protect Your Invention." This booklet contains information on patent protection and procedure. You will also receive an "Invention Record" blank. This will be promptly forwarded to you upon request—no obligation.

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Regardless of which color system is eventually adopted, it seems likely that the receivers will be more complex and expensive than black-and-white sets. They will probably give pictures of comparable sharpness, however, and will be able to receive programs from both color and black-and-white transmitters.

Double Sub Trouble

Sir:

On page 135 [June, "Streamlining Speeds New Subs"] you have two pictures of the best boats in the Navy. I served on submarines during and after the war. In fact after the war I was in the same squadron as the top pictured boat, and for your sake I hope the officers and crews of the two boats do not see the June edition of your magazine.

The two boats' names are reversed, as can be proved by the number "484" on the top picture. I am unable to tell just what boat the bottom one is, but the top one is the USS Odax (SS484). There is a very friendly rivalry between the boats of the fleet, and I think this might cause some comment.

J. D. TROMBLA

Lincoln, Neb.

PS can usually spot its subs pretty well, but in this case the pictures were reversed after the story was written, causing the mixup. The top sub is the USS Odax, the bottom one the USS Pomodon.

Invention of the Age

Sir:

I would like to see them make a set of car brakes that would get tight when the driver did.

MONTY WITBECK

Edmonton, Alberta, Canada

Twice as Confusing

Sir:

There is one matter I would like to be straight on in your August issue. Under the "miscellaneous" part of the section "Popular Science Opportunities" I noticed the Abacus priced for \$3.50, while in your article by W. D. Loy ["How to Use an Abacus," p. 86] there is one for \$6.50. Since they are both made by Loy and are supposed to be

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We recommend that you authorize us to conduct a search through the United States patents pertinent to your invention and to submit a report setting forth our opinion with respect to its patentability.

This firm is registered to practice before the U. S. Patent Office and is available to assist inventors in the preparation and prosecution of their cases. Detailed information and the preliminary steps to take to obtain patent protection will be furnished upon request. *Form below for mailing convenience.*

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D. E. LUDWIG

Reading, Pa.

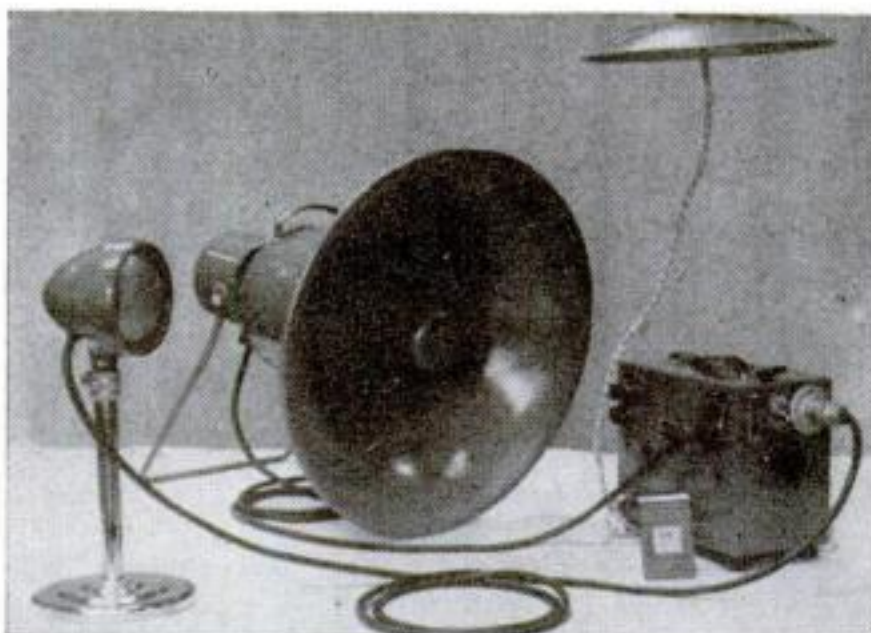
The \$3.50 model advertised in PS is smaller than the one used to illustrate the story. It has only five columns of beads.

The Japs Did It, Too

Sir:

In the March number of POPULAR SCIENCE [Japanese edition] we have learned that the Electronic Engineering Research and Manufacturing Company, of Hollywood, has an intention to build a pick-up system of a carbon microphone of high efficiency directly connected to a loudspeaker system, thus dispensing with vacuum tubes or any amplifier [PS, Amer. ed., Feb. '47, p. 188].

Incidentally, we had the same idea as theirs and have succeeded in putting it in practice to some extent, which resulted in the invention of a sort of carbon microphone [shown below] of special composition which can stand the direct current of 1.5 amperes or more at 12 volts. It can work well with



Japanese version of amplifierless sound system consists simply of mike (left), loudspeaker (center), and rectifier (right), required only when alternating current is used. Entire set, including rectifier, weighs less than 23 pounds.

the help of the re-entrant horn type of speaker, so that no vacuum tube is needed. . . .

R. NOHARA

Yamamizu Co., Ltd.
Tokyo, Japan

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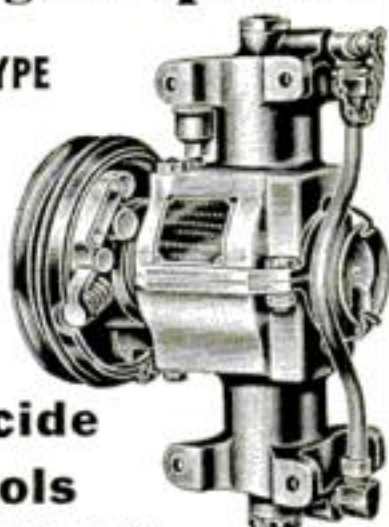
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ing practical ideas and showing the scientific methods of doing many things.

As a farm boy and amateur inventor, I find many useful ideas in your magazine, but I have one suggestion to make. Why doesn't some company print a "Popular Farming" or "Farm Science"; in other words a magazine similar to POPULAR SCIENCE that shows all the new farm inventions, ideas, machines, etc.? . . .

HOYT PATTISON

Clovis, New Mexico

How Not to Clean an Air Strainer

Sir:

Thanks for "How an Expert Does a Tune-up" on page 168 in your May issue.

Frankly, though, I would not want Mr. Riccardi to do a tune-up job on my Chevrolet. He is probably doing more harm than good to the carburetor air cleaner. You will note in illustration No. 11, on page 171, that he is drying the cleaned element with compressed air.

This is what the AC Spark Plug Co. says in its manual on "How to Service Air Cleaners": "Warning! Never use air hose to dry out cleaned element. . . . It is apt to blow holes in the element, allowing air to enter the carburetor without the benefit of filtration. . . ."

The element should be given a good shaking and never cleaned with an air hose. I wonder if Mr. Riccardi knew about this.

BOYCE E. MILLER, JR.

Macon, Ga.

Reader Miller is right. The AC Spark Plug manual says just that. Apparently both PS and Mr. Riccardi were caught napping.

Correcting Our Skysight

Sir:

As a former teacher of aircraft recognition, I must needle you on misidentifying a Lancaster bomber as a British B-24. The two aircraft depicted refueling in flight, on page 79 of your August issue, are both Lancasters.

BEVIN SMITH

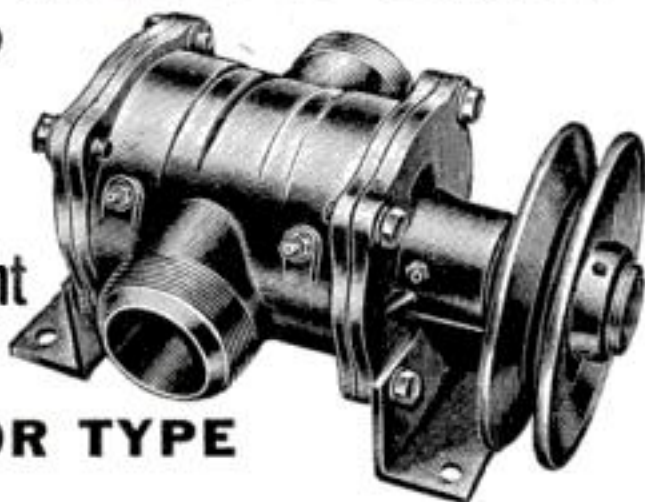
Brooklyn, N.Y.

Expert Smith (captain, USAFR) was the first of many readers to spot our slip. The British have used B-24s for refueling in flight, but this time both were Lancasters.

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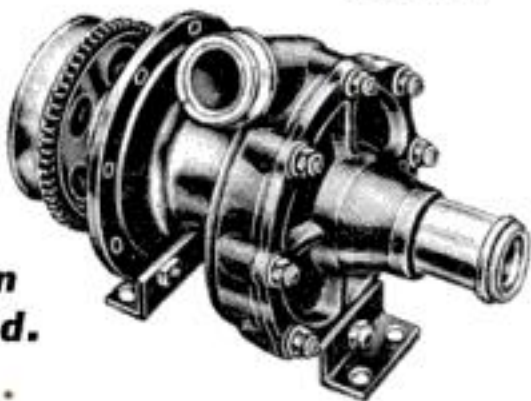
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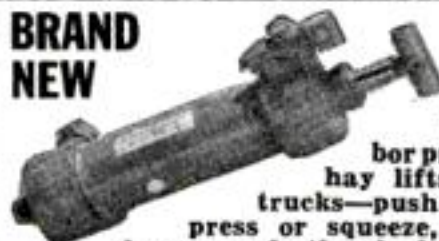
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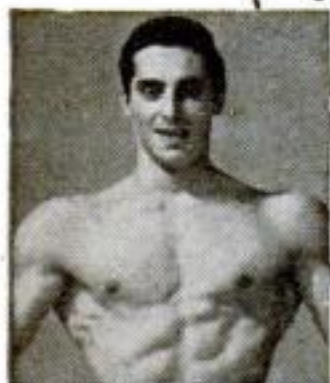
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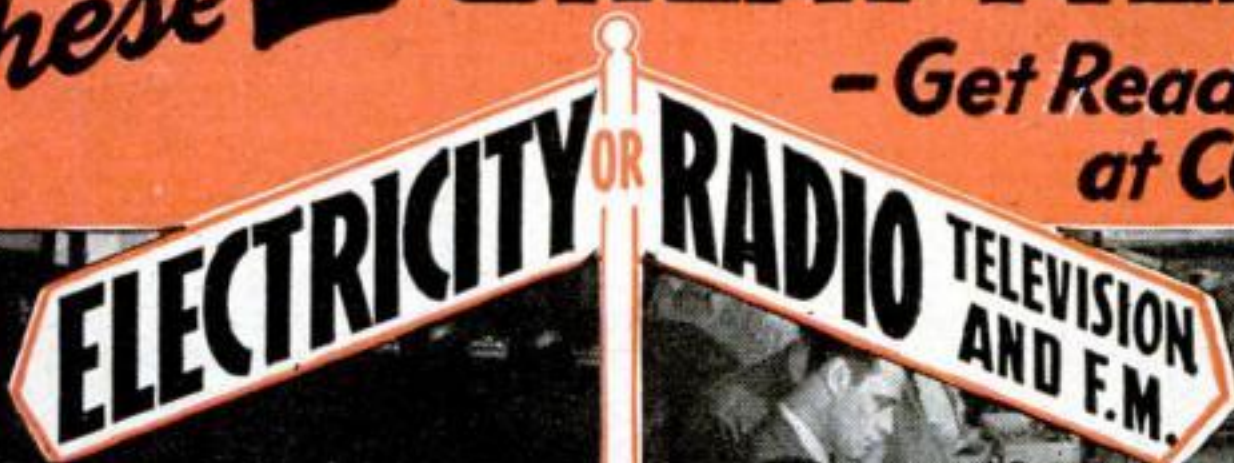
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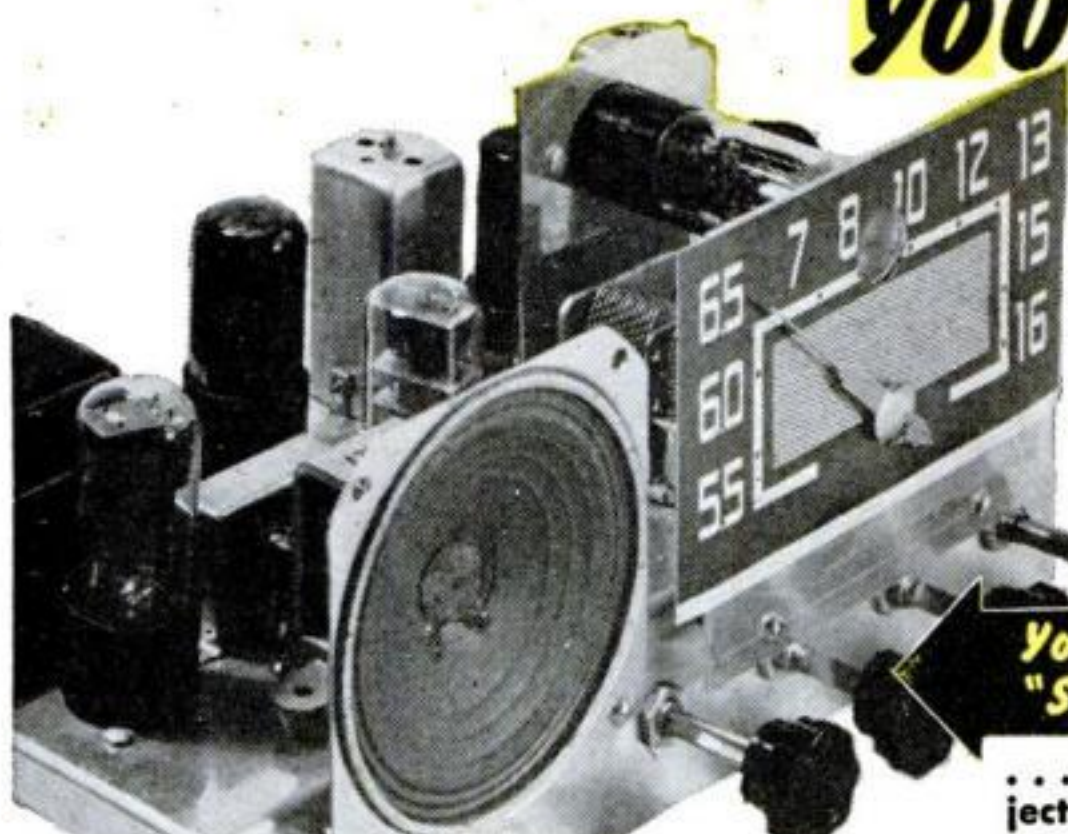
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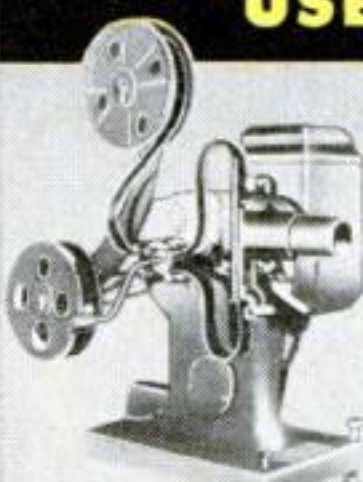
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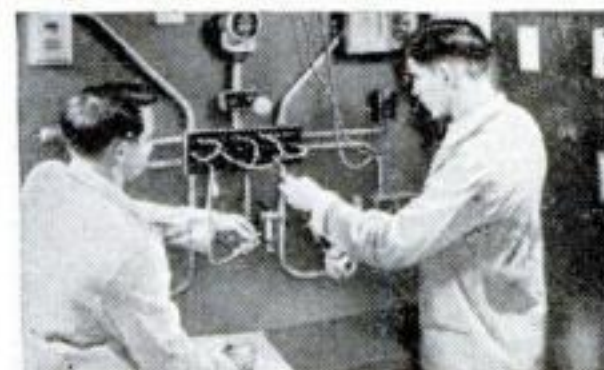
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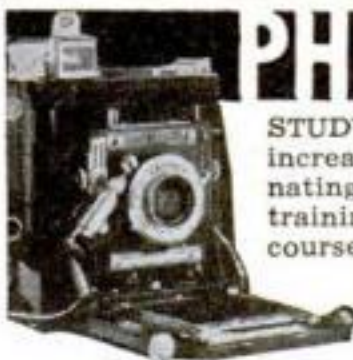
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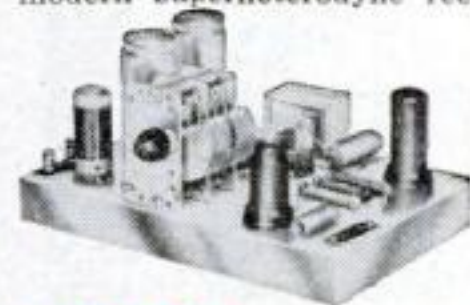


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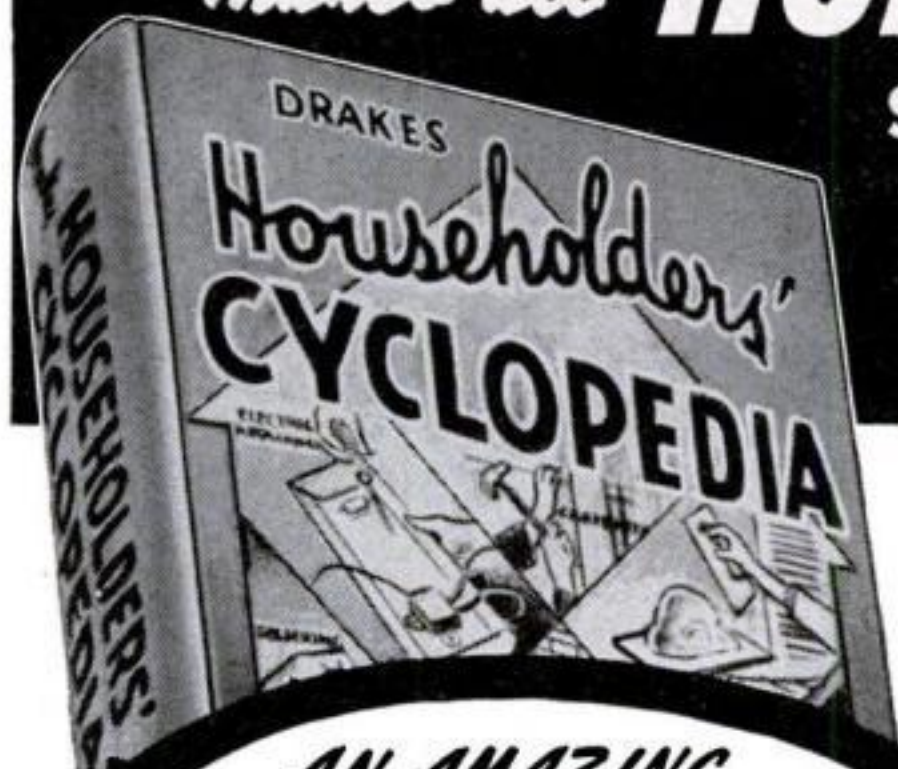
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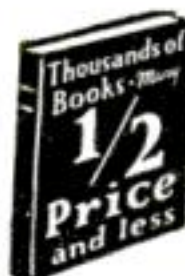
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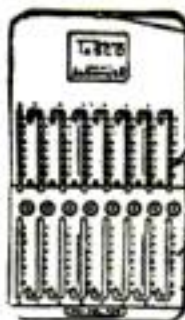
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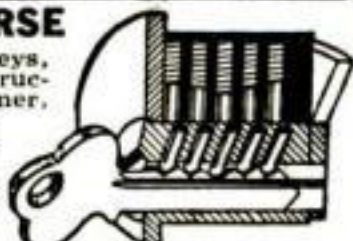
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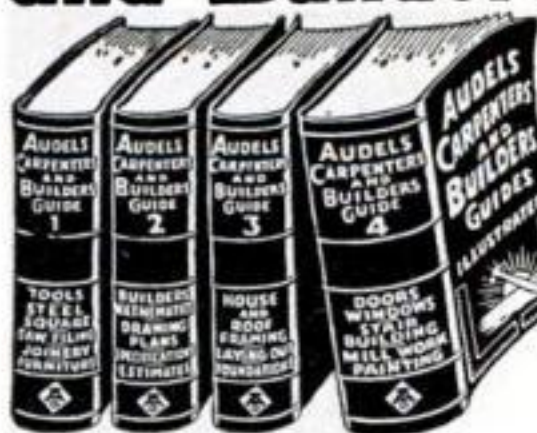
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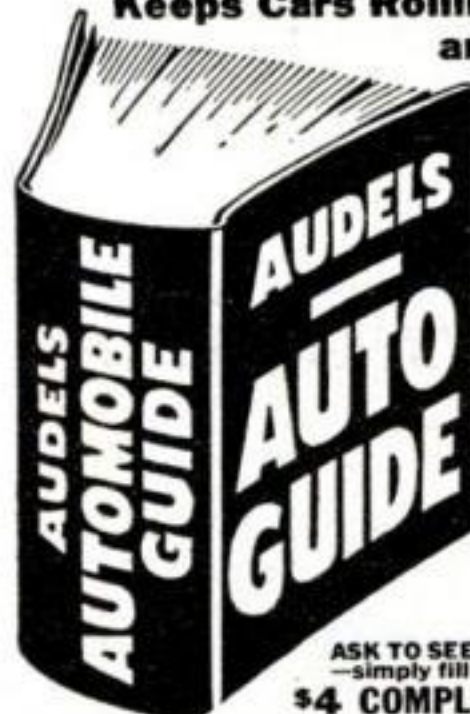
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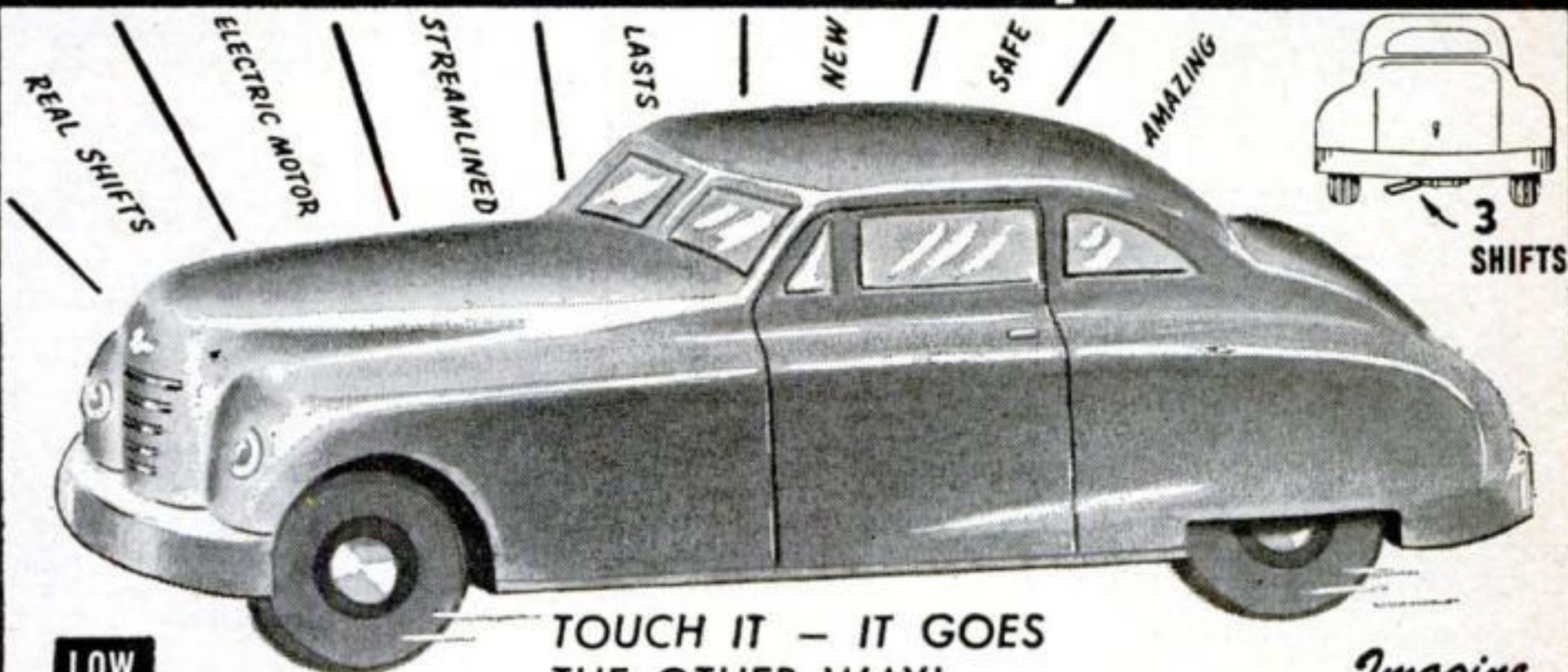
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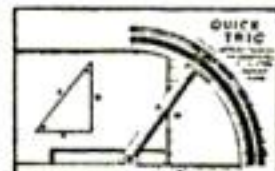
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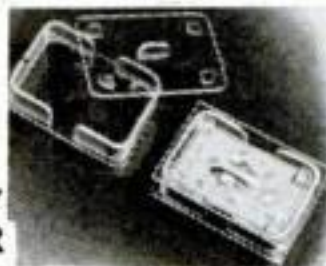
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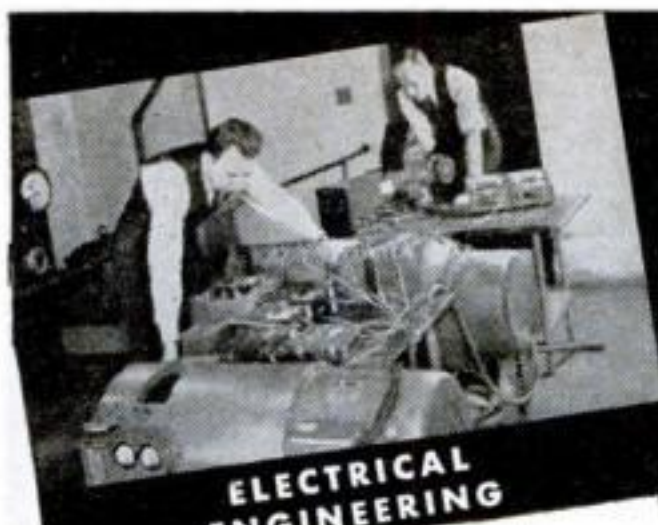
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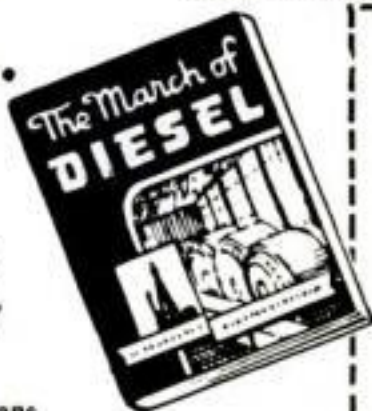
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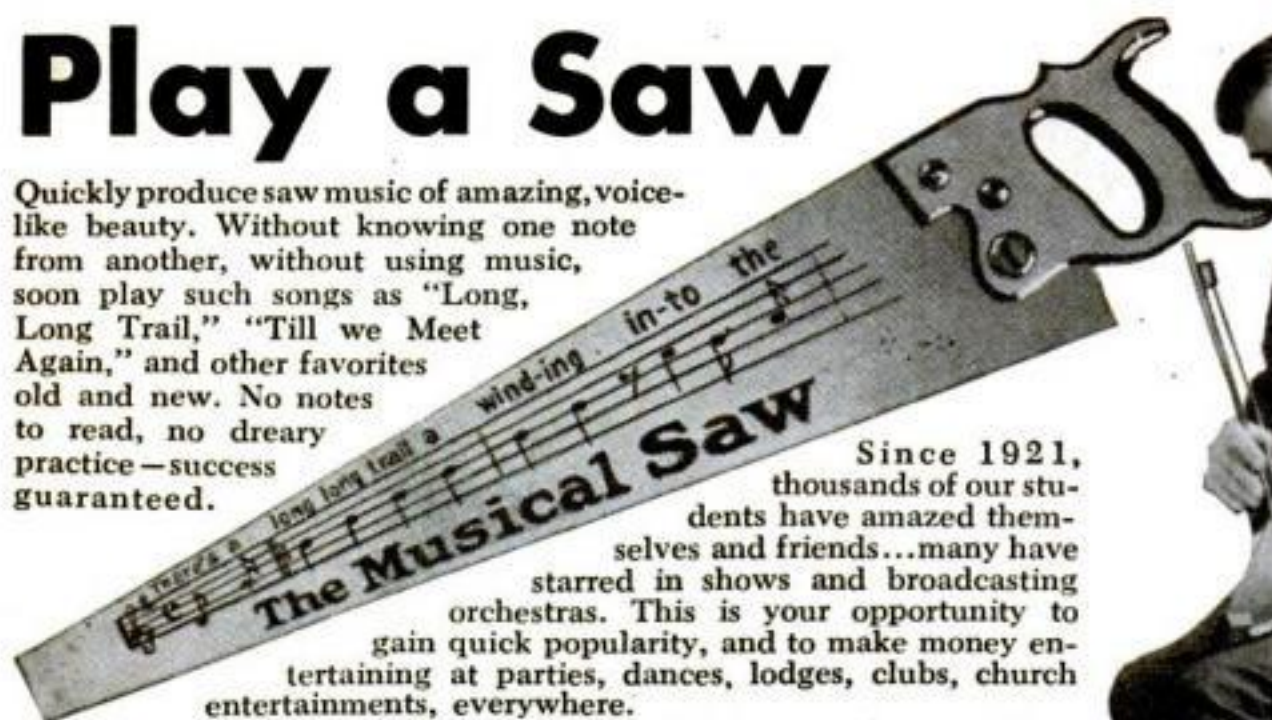
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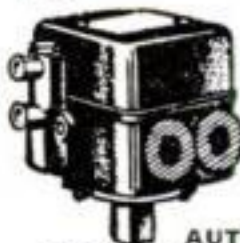
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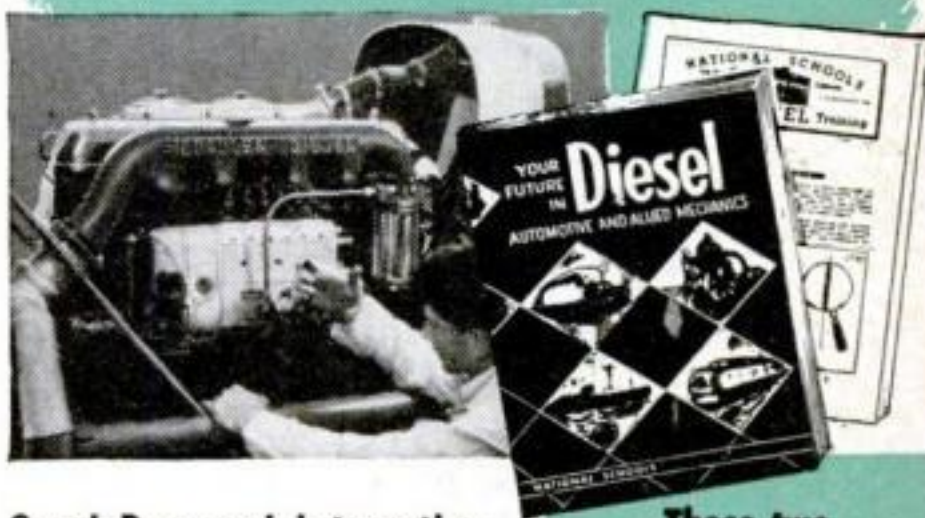
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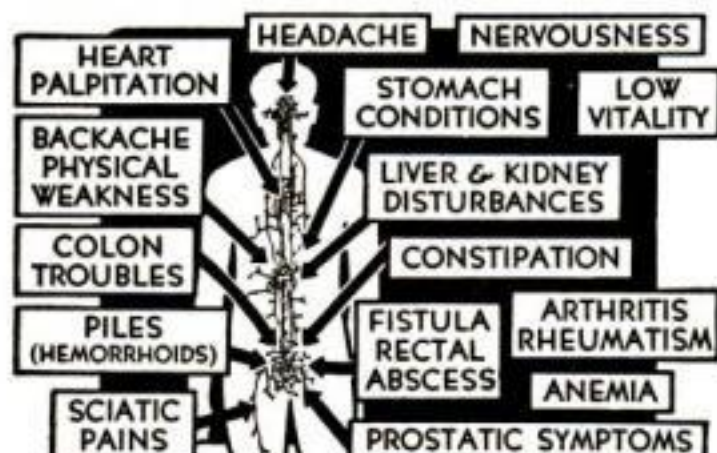
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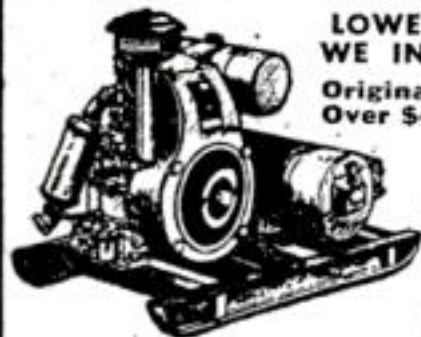
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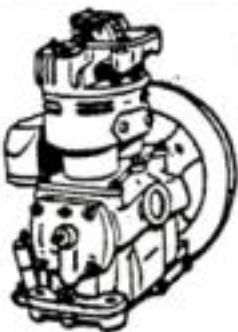
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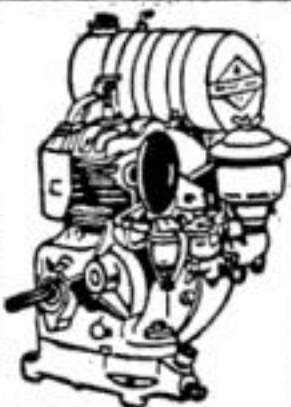


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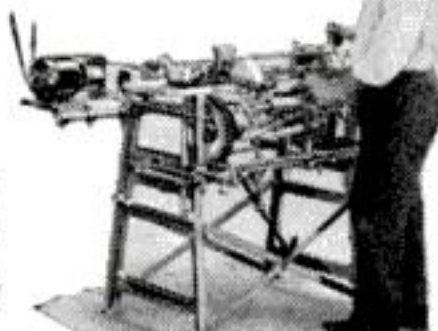
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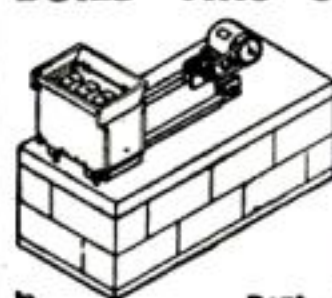
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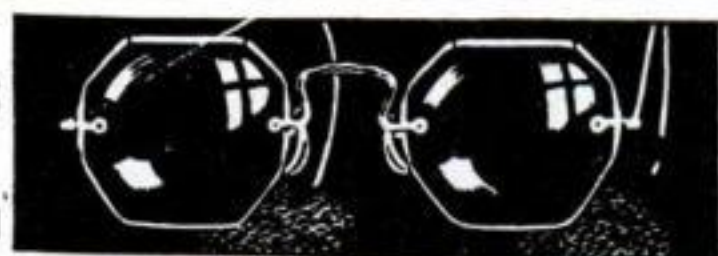
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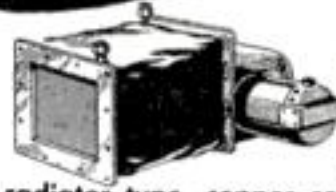
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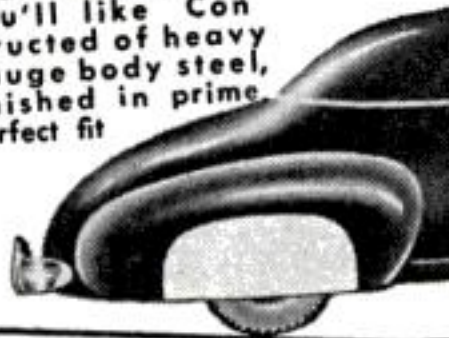
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OCTOBER 1948 65

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He maintains that man, instead of being limited by a one-man-power-mind, has within him the mind-power of a thousand men or more as well as the energy-power of the universe which can be used in his daily affairs. He states that this sleeping giant of mind-power, when awakened, can make man capable of surprising accomplishments, from the prolonging of youth to success in many fields. Strangely, he says that this power works best while we sleep, when proper methods are used.

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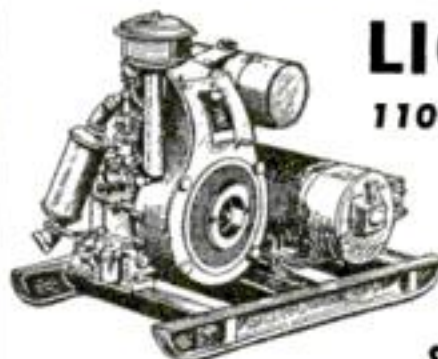
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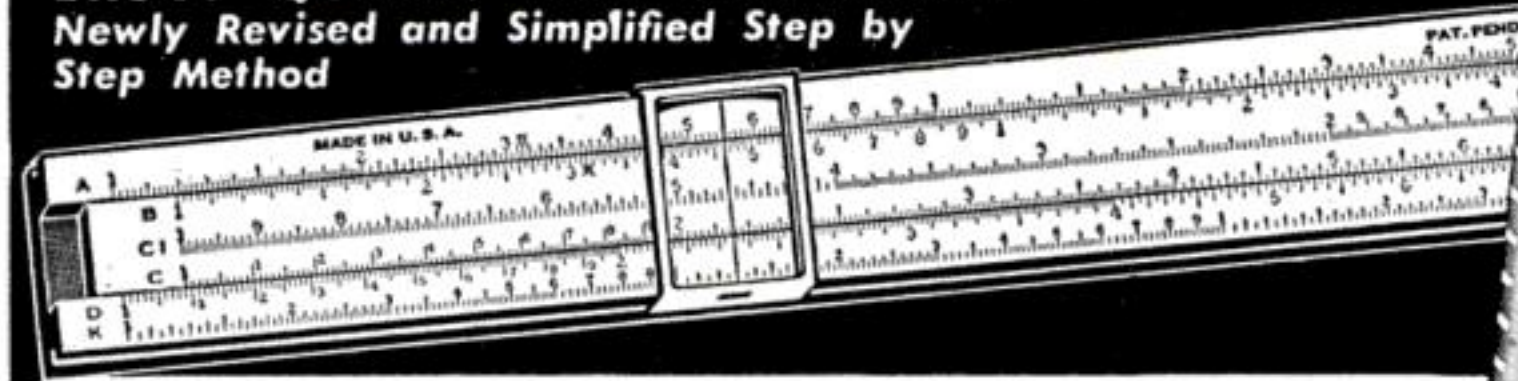
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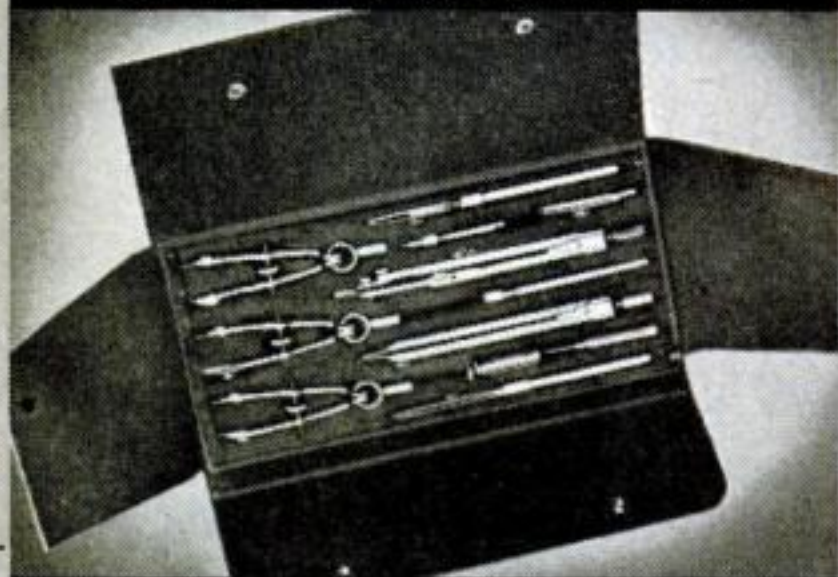
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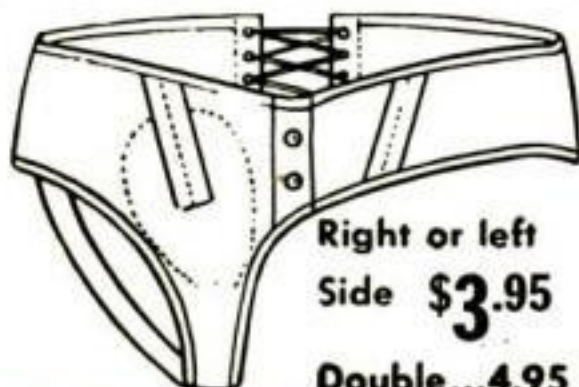
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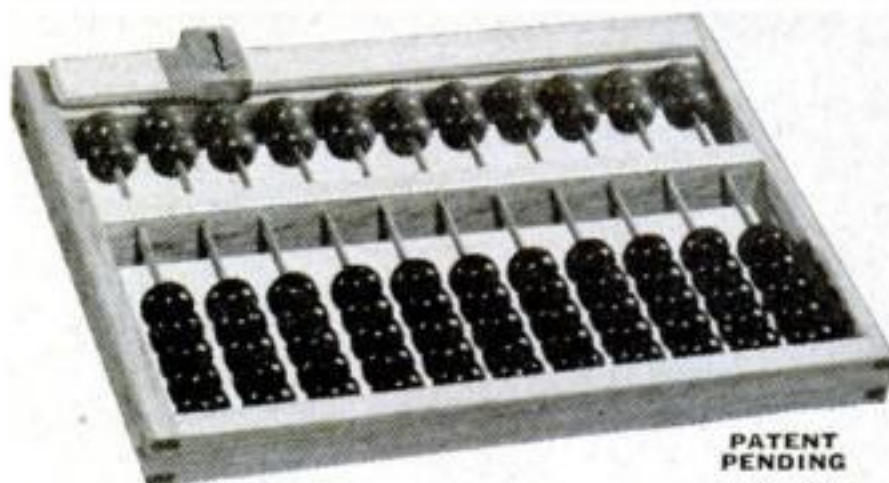
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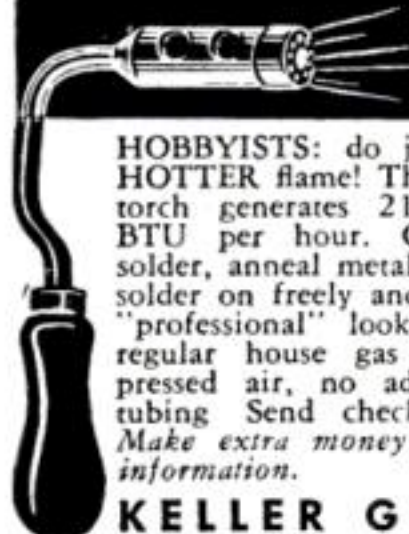
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AGENTS wanted for our coin operated amusement and slot machines in every town and community. Sell—or start your own route. Big profits! Write for free wholesale catalog and deal. Aerobilt Products Co., Dept. 26, 3767 Druid Station, Baltimore 17, Maryland.

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SCHOOL Seniors!!! Your postal will bring our wonder, Kwick-Sell Cardalog of popular Graduation Name Cards. Biggest profits!!! Only firm giving free souvenir chest and Card Case. Don't miss out! Hurry that postal!!! Craftcards, Box 235 (M), Pittsburgh 30, Pennsylvania.

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82 PATENT ATTORNEYS

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83 FOR INVENTORS

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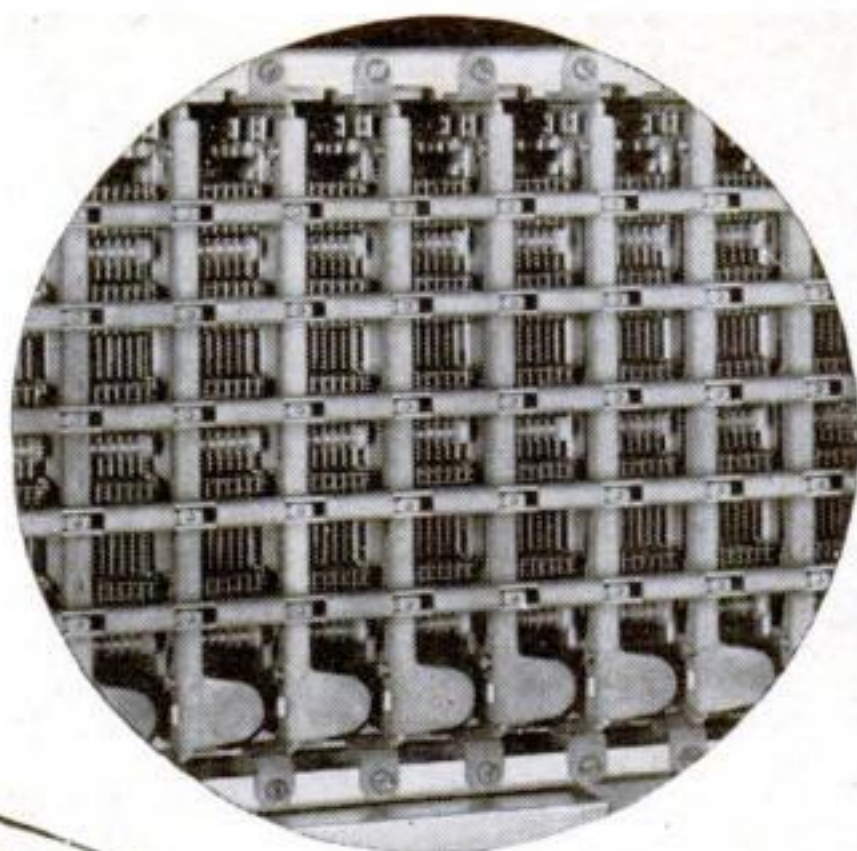
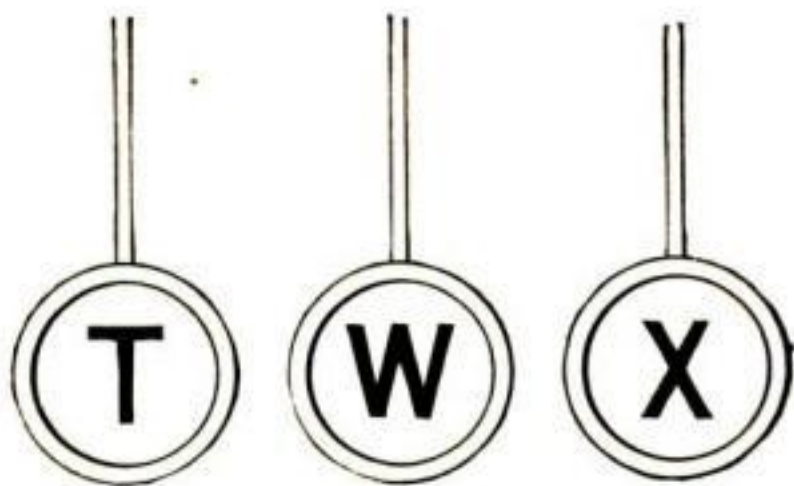
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An Open Letter
To Charles A. Lindbergh

POPULAR
SCIENCE
M O N T H L Y

353 FOURTH AVENUE • NEW YORK 10, N.Y.

OFFICE OF THE EDITOR

24 August 1948

Dear Colonel Lindbergh:

Your new book, "Of Flight and Life", is such a direct attack on science that I have a duty to comment as editor of a magazine dedicated for seventy-six years to a wider understanding of science and technology.

In the condensed version published in the September issue of THE READER'S DIGEST, you say:


"I believe that if we do not control our science by a higher moral force it will destroy us with its materialistic values... Science now threatens our balance with its overemphasis of mind and its neglect of body and spirit. Its bombs are only a wartime manifestation of the materialism with which it attacks all life. We are becoming slaves of its war machines, its mines, its factories, its offices and balance sheets, its bureaucracy and regulations."

Your personification of science as an evil force is a groaning old ghost around this office, Colonel. Seventy-five years ago it was a common complaint. My distinguished predecessor, Edward Livingston Youmans, founder and first editor of POPULAR SCIENCE MONTHLY, even had to defend the magazine against charges of atheism.

In the issue of POPULAR SCIENCE MONTHLY dated September 1873, Editor Youmans had this to say, summing up one attack by the London SPECTATOR: "The SPECTATOR would have been equally honest and less absurd if it had compressed its article into two lines: 'What is modern materialism? A dirty label to be plastered on the evolutionists.'"

Darwin hardly needs defending nowadays, and neither does Einstein. But you were not the first to blame science for man's ills, and you will probably not be the last — until Mankind knows more about Man. This is what Youmans wrote in POPULAR SCIENCE for July 1874:

"The hope is indulged by many that with the progress of intelligence the old conflict between religion and science will either die away or lose so much of its rancorous spirit that it may be coolly and rationally considered like any other question. But there are parties who do all they can to perpetuate the acrimonies that have marked this controversy...and, while we will not say that this bad spirit is all on one side, we will say that the most of it and the worst form of it are on one side, and that the side which makes special pretensions to a higher guidance and the loftier virtues."

Nowadays, I am not going to argue whether Man is a manifestation of God — or vice versa. But I can reiterate the belief of my predecessor that science is the product of man. It is a method and a record of man's orderly groping for truth. It cannot be charged as a separate and responsible force any more than the paper on which you wrote "Of Flight and Life" can be held responsible for what you say. 

You are right, Colonel Lindbergh, in your fears for the state of the world. Man has loosed ideas he has not matured enough to control. But you are as wrong as your predecessors when you blame science. For you are simply saying, as does a child, "The knife cut me."

When you embody science as a force — and a force for evil at that — you are confusing the issue. Fortunately, your concept of science overwhelming morality is erroneous. Otherwise you would have to face the sad conclusion that if science has won the mythical battle for man, then morality and religion have lost it.

In your youth, you say, "I grew up as a disciple of science... I have felt the godlike power man derives from his machines."

Now, grown older, frightened by the mechanical dishonesty of an oxygen gauge which blacked you out 41,000 feet over Willow Run, aghast at what bombers did to Germany, you say, "I have seen the science I worshipped, and the aircraft I loved, destroying the civilization I expected them to serve."

Now, you pause in a life of action to take thought on deeper meanings. But if youthful love of aircraft implied a kind of arrested development in the understanding of life, the public renouncement of science suggests a somewhat arrested maturity.

This confusion of science and evil is most evident in your appraisal of Germany's defeat. When you previewed the Luftwaffe, you preached the futility of opposing Hitler. Now you say:

"The Germans, too, had been an educated people. Few nations had contributed more to our civilization in the past — in art, music, religion, philosophy, science — in science above all in modern times. They had worshipped science. To it they had sacrificed the quality of life — yet they had not gained the power to survive... In their search for materialistic power they had set up science as their god, and science had destroyed them."

These are the kind of half-truths which are whole lies. The Germans denied science when they set up the false premises of prejudice. They cut their own throats scientifically when they drove out people like Freud and Einstein and Lise Meitner. When they set soldiers over scientists. When they elected to smash people rather than atoms.

It was not the Nazis' misplaced faith in science which destroyed them; it was their inhuman misuse of science in their laboratories, torture camps, and communications channels. Above all, it was their neglect of the sheer honesty of science which seeks the truth even when it hurts.

We need more, not less, science today. We have barely begun to turn the knife of knowledge on ourselves, to cut into the secrets of human behavior. It will be a long and painful process. The surgeons of the soul will have an even more difficult time than the splitters of the atom.

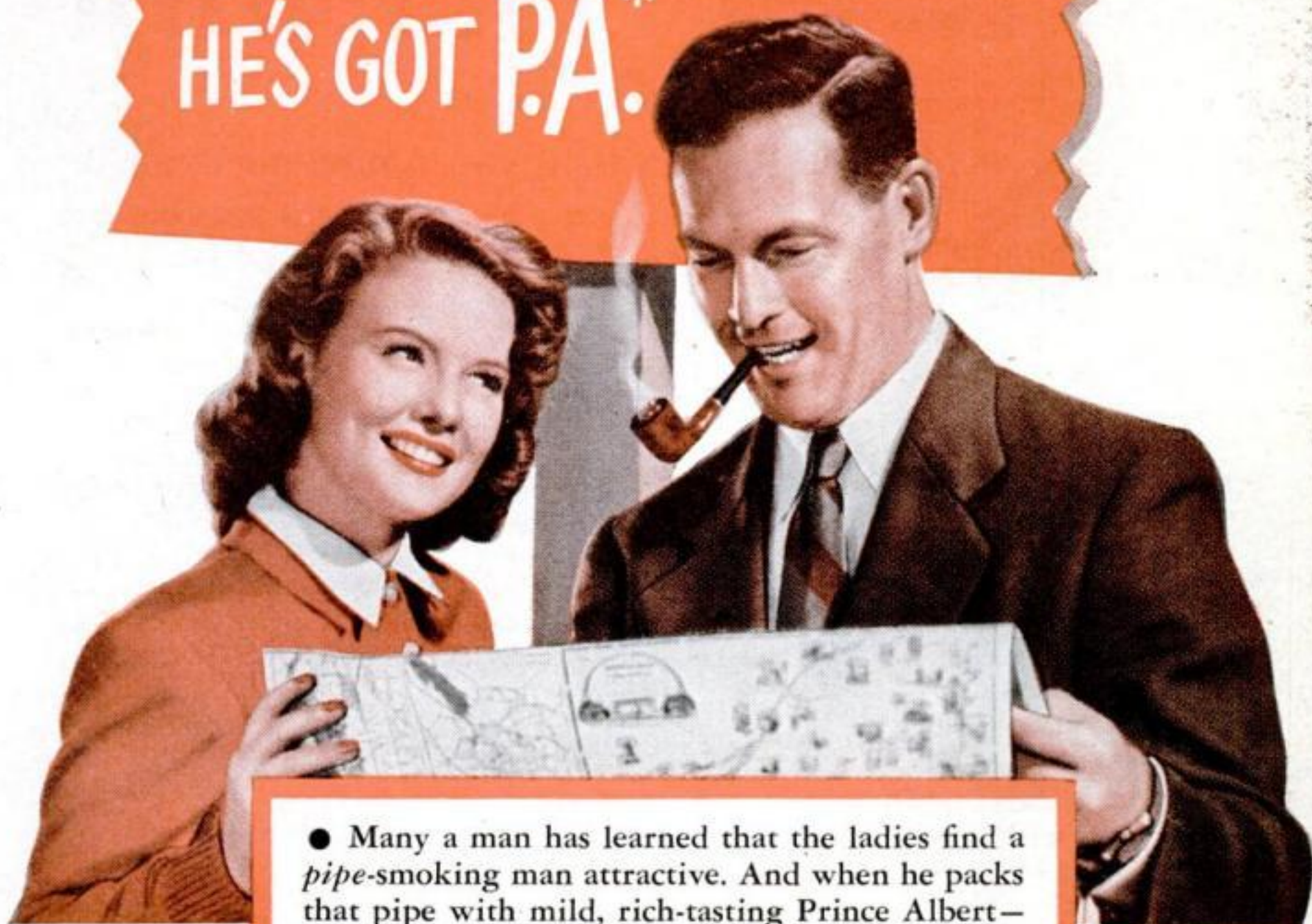
It is a part of the process that men like yourself recognize forces, by whatever name, behind and beyond your instruments. But it would be better, Colonel Lindbergh, for you to think of science as a human instrument, a light which can help man to discover and understand the values of morality. Not as a modernized superstition which can excuse man's fears.

Otherwise, your book were better named: "Of Flight from Life."

Sincerely,

Perry Githens

HE KNOWS THE WAY—
HE'S GOT P.A.*



● Many a man has learned that the ladies find a *pipe-smoking* man attractive. And when he packs that pipe with mild, rich-tasting Prince Albert—it shows he knows real smoking pleasure!

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Locks Out the air —
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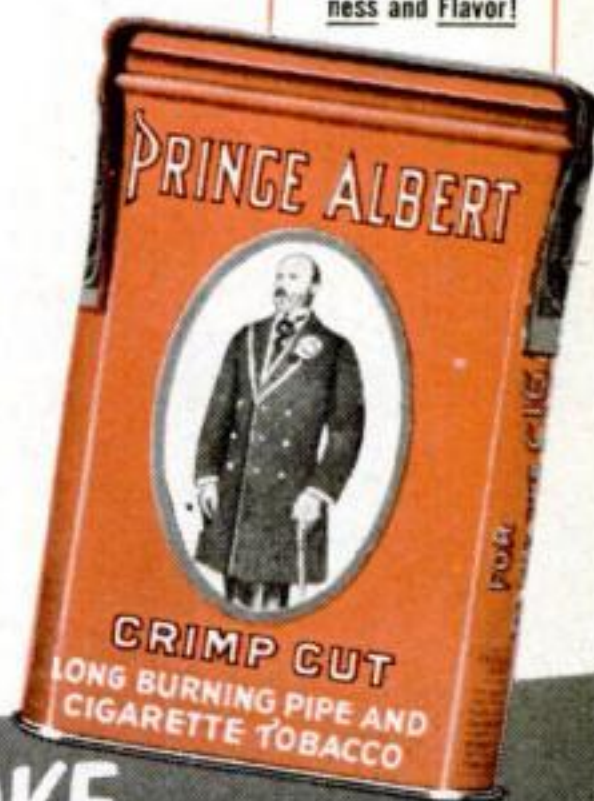
P.A.* means Pipe Appeal
P.A. means Prince Albert

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THE NATIONAL JOY SMOKE



Your Home: Your Own

But it needn't be if you follow the experts' simple, practical advice on prevention, detection, and protection.

By Devon Francis

Drawings by Sigman-Ward

The following article was prepared with the assistance and cooperation of the National Fire Protection Association, of Boston, and the National Board of Fire Underwriters and the Fire Protection Institute, both of New York City. This does not necessarily imply their approval of the devices pictured or described.

A FRIEND of mine dropped around the other day to tell me a story. He had a funny look on his face. It was a mixture of delayed-action fright, shame, and disbelief.

"A fire broke out," he related. "It broke out right in my own house!"

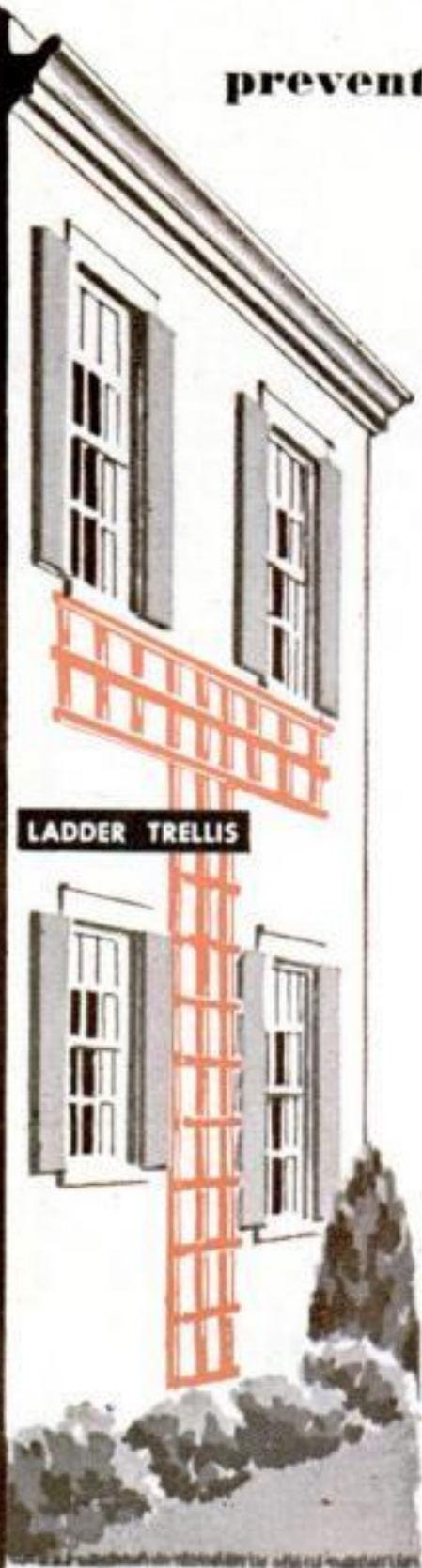
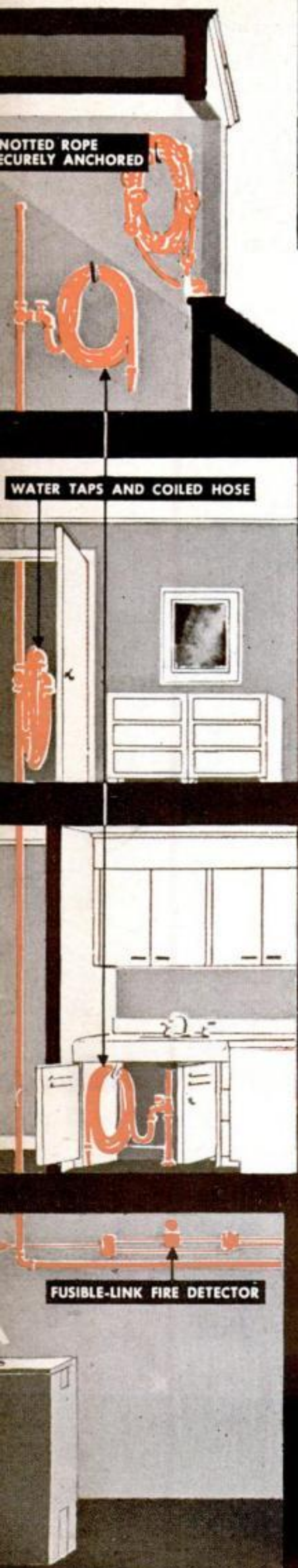
"What did you do?" I asked.

"I called the fire department. They put it out. But the fire wasn't what scared the pants off of me when I got to thinking about it afterward. What scared me was what I did when I discovered the fire."

He paused, and that funny look freshened on his face.

"I just stood there for a long second, paralyzed. I said to myself, 'This can't happen to me!'"

Best homemade fire-protection device you can contrive is simple standpipe— $\frac{3}{4}$ - or 1-in. riser—cut into water system and run up through flooring from basement to attic beside chimney. Valves and lengths of coiled hose complete the system. Then add a couple of fire escapes—a coiled rope, knotted at one-foot intervals for handholds, and an outside trellis securely anchored and strong enough to support a person's weight. This is only fire *protection*. For practical tips on home fire *prevention*, see opposite page.



Firetrap

My friend put his finger on the fundamental cause of most home fires. It's the carelessness of the homeowner, a carelessness fed by sublime belief that fire can always happen to the other fellow but it can't happen to him.

This month during the annual National Fire Prevention Week—October 3-9—firemen all over the nation will try to tell the public that fire can happen to anybody. They will tack up posters and make talks. Their message will be that fire happens in thousands of homes every day, damages or destroys an estimated 340,000 homes a year.

Fire can happen to *you*. Your home is your own private firetrap.

Home fires are inevitable. Someone tosses oily rags into a locker made of combustible material. The oil oxidizes. That produces heat. Spontaneous ignition follows. Or someone leaves matches around where a child can reach them. Or someone tries to clean clothes with gasoline. Or someone fails to replace a worn electric cord. Or someone knocks over a portable oil heater.

That, of course, doesn't exhaust the list of reasons for home fires. Your own home—your own firetrap—probably contains a dozen neglected spots where fires can start.

Yes, it *can* happen to you. But the chances of its happening can be chopped sharply with proper fire protection for your home. Now, this fall, with the season of high fire losses approaching, the American homeowner can enlist new help against fire. Efforts are being made to slash home fire losses by other than preventive means. New fire-fighting and fire-detecting equipment specifically designed for the home is coming onto the market.

In this article on fire, POPULAR SCIENCE is going to show you how to keep fires from starting and how to stop them if they happen to get started. It will tell you how to make some of your own fire-protection and

Keep oil rags in extra step-on can. They can ignite spontaneously.



Keep electric cords free from abrasion. Replace if worn. Don't overload lines.

U. S. Navy specifies flame-proof curtains on ships. Use same insurance in kitchen.



Propping stove door open when you broil a steak keeps greases from overheating.

Never use flammable liquids to clean clothes. Mere rubbing can ignite them.



Warning light when current's on will help prevent overheating electric appliances.

Salt or baking soda on stove will put out grease fire. Keep used fats off stove.



Keep volatile flammable liquids in spring-spout, red containers outdoors.

Basic Types of Home Extinguishers

VAPORIZING LIQUID

Using carbon-tetrachloride base, this is best known type of home extinguisher. Costing less than \$20, extinguisher is good on Class B and C and small Class A fires. It throws stream 25 to 30 ft. by pump action after half turn of its handle. Contents blanket off oxygen. Disadvantage is container's limited supply—1 to 1½ quarts. Extinguisher should be recharged immediately after use. Experts warn against use of methyl bromide, which is highly toxic.



CARBON DIOXIDE

Makers of carbon-dioxide extinguishers now offer homeowners units costing \$10 to \$20. This squeeze-grip model contains 2½ lb. of gas, good for 12 to 15 seconds. Excellent for oil, grease, and electrical fires but recommended only for very small Class A fires. Extinguishes almost wholly by blanketing effect. Gas is completely harmless except in high concentration in closed room. Liquid gas vaporizes at 110° below zero F. in horn-type nozzle. Range: only 6 feet.



SODA-ACID

Less popular in home, soda-acid extinguisher shoots stream of water 30 to 40 ft. For Class A fires only, it costs about \$35. Works by generating carbon-dioxide pressure on water from chemical reaction of soda and sulphuric acid. Is merely upended for use. Its 2½ gal. of water extinguishes by cooling, drenching. Contents must be protected by anti-freeze mixture if exposed to low temperatures. Another version of this type has CO₂ cartridge for pressure.



fire-fighting equipment. It will show you what *not* to do in fighting home fires.

There are three things to do to keep fire from plundering your home: (1) Discourage it from starting. This is *fire prevention*. (2) Discover it early if it does start. This is *fire detection*. (3) Be prepared to keep a little fire from becoming a big one until the firemen come. This is *fire protection*.

It is a commentary on American carelessness that home fire prevention, detection, and protection have always been a three-headed orphan in the national effort to reduce fire losses—despite the fact that more than half of all fires occur in homes. Factories have fireproof doors to wall off flames. Homes don't. Business structures have automatic sprinkler systems. Homes don't. Anything and everything except homes enjoy periodic fire-hazard inspections.

Nobody really knows—would you believe it?—just how many home fires happen in the United States every year and the actual replacement cost of homes that go up in flame and smoke. Elaborate statistics are kept on how many people are killed and injured by automobiles. But the figures on home-fire losses are only a projection of incomplete information gathered hither and yon by fire-insurance companies and local fire departments.

By all odds the best way of keeping your home from becoming a fire statistic is to see that a fire would have a tough time getting started. *Fire prevention* begins with an understanding of why your home can burn.

Firemen divide fires into three classes: Class A fires are those in ordinary combustible materials, such as wood, paper, textiles, and rubbish. Water and water solutions work best on them. Class B fires are those in flammable liquids (such as gasoline), greases, and oils. They can be put out only by shutting off their oxygen supply. Class C fires are those in electrical equipment. The extinguisher must be a nonconductor.

Firemen have a saying that no home is any more fireproof than its contents. Old cotton rags or discarded newspapers and magazines littering a corner of the attic are highly combustible. So are the pyroxylin plastics from which combs, eyeshades, hairpins, buttons, toys, and other items of everyday use are manufactured.

The wood in the basic structure of your home is only relatively less combustible. The curtains and drapes at your windows can burn. Cotton and rayon dresses hanging



Carbon-tetrachloride extinguisher has added advantage of emitting liquid that doesn't stain and evaporates in few seconds. It's good for fires in fabrics and overstuffed furniture.



Co₂ bottle in furnace room is extra protection against basement fires. Here flame from spilled oil is put out almost instantly. Manufacturers warn against touching "snow" from nozzle.

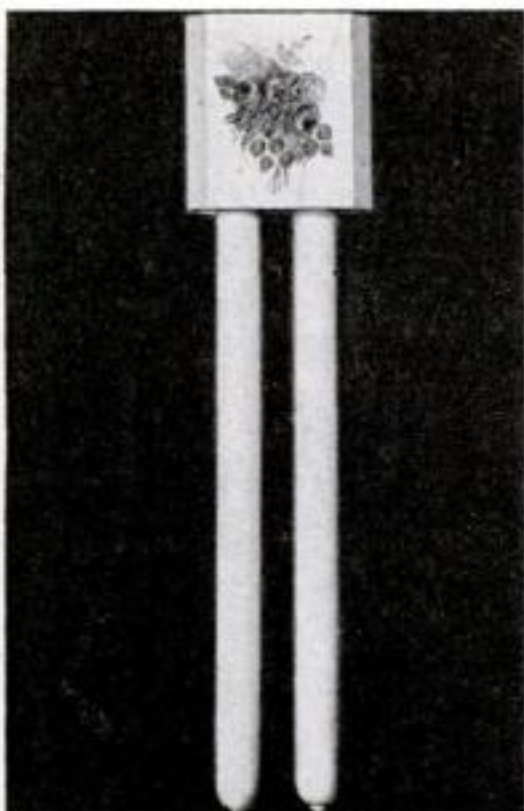
in the closet will reduce to ashes in seconds. Your furniture can burn. The grease from a pork chop in your kitchen frying pan is highly flammable.

The National Board of Fire Underwriters, supported by capital-stock fire-insurance companies, remarks with understatement, "Money spent for *prevention*, such as for ash trays, approved electrical wiring and appliances, repairs to chimneys, new stove-pipe, metal waste and ash cans, fireproof cellar ceilings, and fire-resistive roofs, is more worthwhile than that for extinguishing equipment."

With this article are pictured recommendations for making your home more fire resistant.

But fires will happen. How do they start?

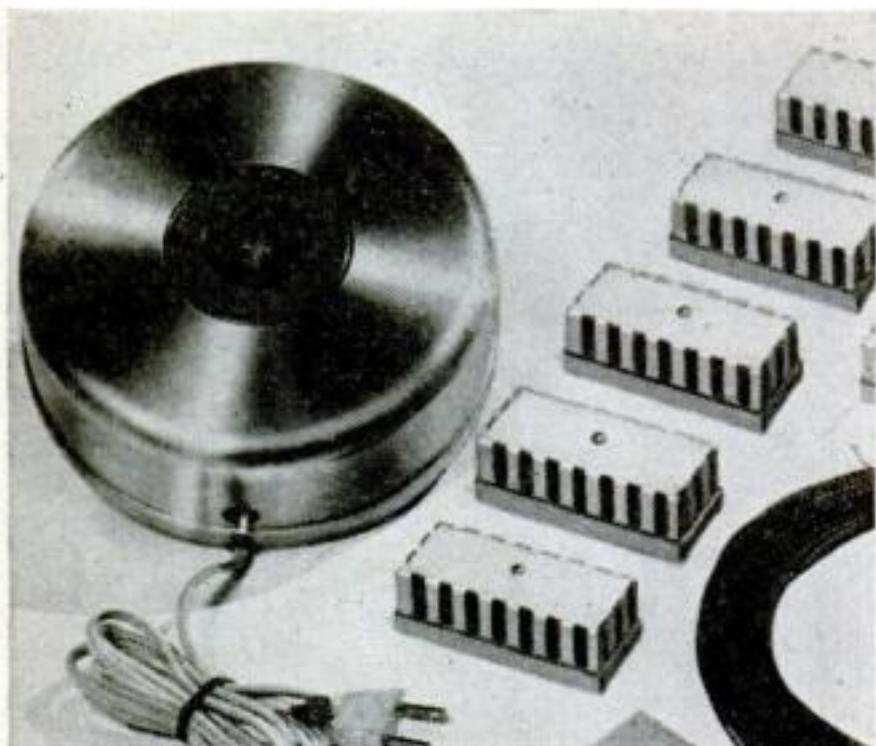
Firemen and insurance companies can tell you in blunt words that nine out of ten fires need never happen. Careless tobacco smoking and use of matches head the list of causes of home fires. There are seven other primary causes: faulty electric circuits, sparks dropping on wood-shingle roofs, defective chimneys, rubbish and spontaneous ignition, defective heating equipment, lightning, and improper use of flammable liquids.



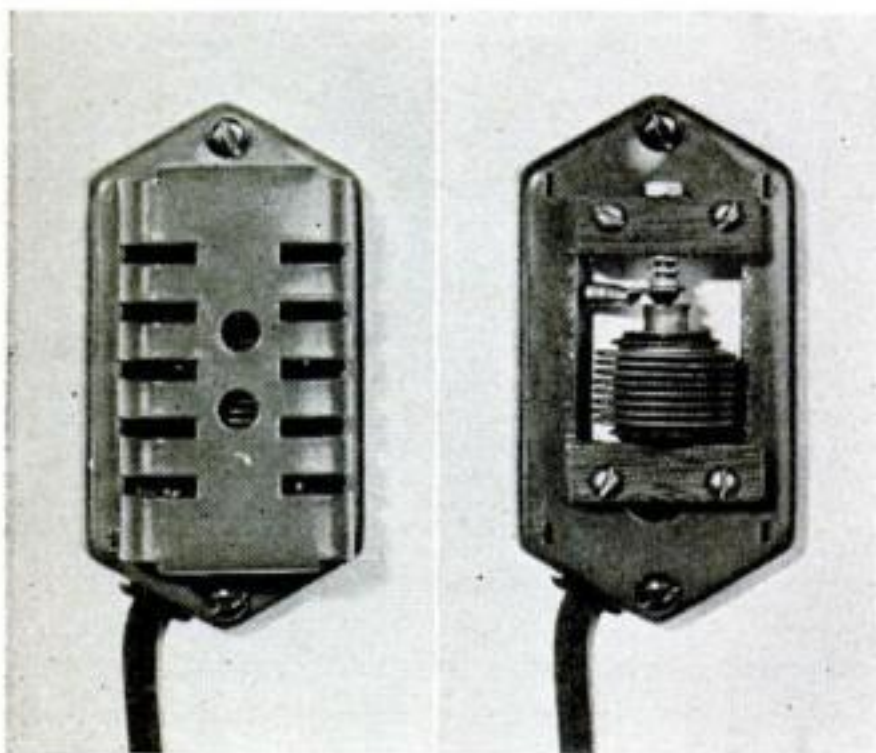
Titan's FireWand® has a door-chime design. Makers of CO₂ extinguishers urge annual weighing to detect loss.



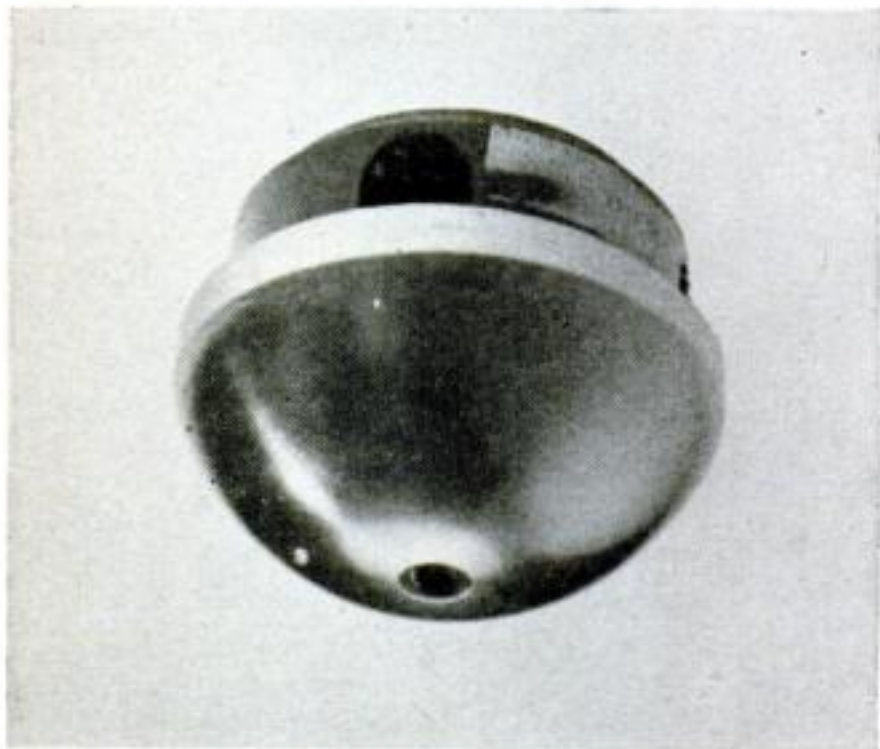
Water is best for putting out all Class A fires. Here, soda-acid metal bottle, generating gas pressure to squirt water, is used on basement fire in combustible rubbish. Among leading makers of home extinguishers are Walter Kidde & Co. and Pyrene Manufacturing Co.



Home fire-detection devices such as Ingersoll & Co.'s Fire Tattler® use fusible link. Fine wire melts before reaching 170° F., sets off alarm plugged into regular 110-volt outlet.



Automatic® detector, made by Ruxton Metal Products, has gas-filled bellows that expands at 130° F., ringing bell. It can be plugged into doorbell circuit, or given own dry cells.



Thermoskope®, by Electro-Protective Corp., responds both to rapid rise in temperature and to 165° heat. Attached to ceiling and plugged into doorbell circuit, device covers 900 sq. ft.

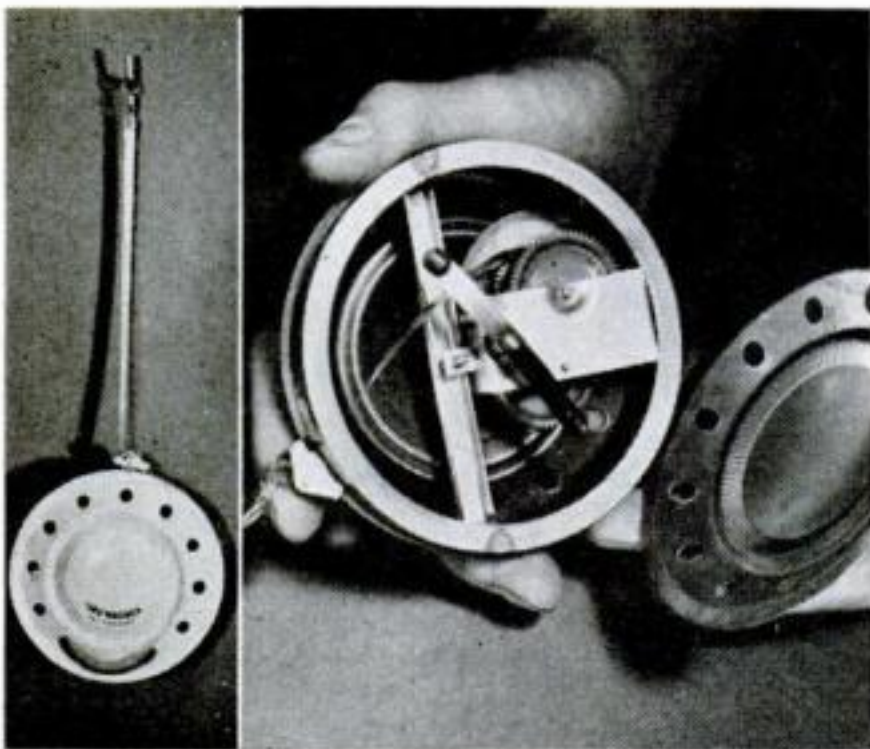
Most home fires start in the basement—because it is there that most of the household's combustible loose materials are stored. There the furnace is located. There, too, is usually a ganglia of electrical wiring and fuel lines. There, often, is the home workshop, with its wood shavings, turpentine, and other items waiting expectantly for a flame.

Fire under the main floor is exceptionally dangerous because heated air and the gases that saturate it go up. Any stairway acts like a flue in a fireplace. So do the hollow spaces in walls between the studs if there are no fire stops.

There are two other common starting points for home fires—the kitchen and the attic. The kitchen is dangerous because open fires must usually be used for cooking. Matches are stored there too. The attic is dangerous because the sun, beating on the roof, dries all the useless junk that the average family can't bring itself to throw away. The attic is dangerous for two other reasons: it is the hardest place for the home owner to get at to fight a fire; and it is right under the shingles, where a wind-borne ember can start a fire.

There is still another place where home fires often start—in the bedroom. People still insist on taking that last smoke of the day in bed. And here's a tip: If a fire starts in a mattress, chuck the mattress itself out the window—it's practically impossible to put out a fire in a mattress once it gets going.

Home fire *detection* has been in a pretty rudimentary state, along with prevention and protection. Every company that has set out



Fire Warden®, made by Premier Appliance Co., works mechanically. Detector, shown installed at left, is set off by melting of fusible link. Gravity, unreeling metal ribbon, sounds alarm.

to make fire alarms exclusively for homes has gone broke from public indifference.

But the manufacturers of household fire-detection systems finally seem to be getting their foot in the door. It takes only one fire to make a convert out of an unbeliever. In the accompanying illustrations you will see some of the so-called "local" fire-alarm systems now on the market. They aren't expensive—far less expensive than fire itself. If you like, you can make your own alarm system at a cost of a few cents and a walk to the nearest hardware store.

Associations dedicated to fighting fire

losses in this country are not of one mind in appraising fire-detection systems for the home. Some insist that a gimmick screwed to the wall or ceiling gives a homeowner a false sense of security. They repeat that the best way to fight fire is to prevent it.

If fire prevention fails, home fire *protection* is your last resort. It rests, first and foremost, on your fire department. What you do *after* you turn in the alarm completes the cycle of making your home fire-resistant. The rules at the bottom of this page tell what to do when a fire breaks out.

Confining the fire is half the battle. The

How to fight a fire:

GET EVERYONE OUT

IF FIRE BREAKS OUT in your home, get everybody out. **KEEP THEM OUT.** Don't let anybody go back to rescue that \$5 bill from the sugar bowl or to get the family cat.

CALL THE FIRE DEPARTMENT

Don't worry about bothering the firemen. They would rather answer a small alarm than a big one. And little fires can become big fires fast.

CONFINE THE FIRE

Slam the doors and the windows of the room where the fire is.

FIGHT THE FIRE

Fight the fire only if the blaze is small and you think you can whip it—and *only after you have called the fire department.* What you do in the first five minutes of a fire is worth anything anybody can do in the next five hours.

Keep a retreat open. Don't let a fire get behind you.

Look around for emergency weapons. Sand or earth from flower pots makes a good extinguisher if you have nothing else.

A wool blanket or rug is good for smothering small fires. So is a wet broom.

Salt or soda is good for grease or fat fires in or on the stove. You can smother a frying-pan fire by clapping a cover on it. *Don't use flour.* Flour will burn.

Direct water or extinguishing fluid at the *base* of the flame, not at the flame itself.

Don't throw water on an oil or grease fire. You will only spread the fire.

Don't use water on an electrical fire. You may get a shock that will kill you.

Don't pull down burning curtains with your bare hands. Use a pole or a broom.

Keep calm. Panic is as dangerous as fire.

Some supplementary hints:

If suddenly you smell smoke, don't open a door to investigate until you have felt it with your hand. If it's hot, *leave it closed.* Fresh air on a smoldering fire may cause an explosion.

If you smell gas, close the master valve and investigate with a *flashlight.*

Play safe against smoke and fumes. Tie a wet cloth, preferably wool, across your mouth and nose before entering a room where a fire has started. If the smoke gets heavy, retreat on your hands and knees. The best air is nearest the floor.

fire in your furnace is a safe fire only because it is confined. A fire in a deep-fat kettle on the kitchen stove is dangerous only if it doesn't remain confined to the kettle. When you manage to confine a fire, you are buying time for the fire department.

And don't gamble with a fire. The chemical nature of fire makes it too dangerous to fiddle with. Three out of every four persons who are killed in fires die upstairs from fires that start downstairs and generate poisonous gases and superheated air.

Burning wool, silk, and leather give off hydrogen sulphide, which is poisonous in a concentration any greater than 20 parts in 1,000,000 parts of air. They also give off hydrogen cyanide, equally poisonous, and ammonia, only slightly less poisonous.

Paper, wood, wool, and silk break down in burning to supply carbon dioxide, of which the human body is tolerant, and carbon monoxide, of which it is not. Other gases that may be encountered in a home fire include acrolein (from lard or other animal fat), sulphur dioxide (from rubber and refrigerant gases), and the nitrogen oxides (from pyroxylin plastics). The nitrogen

oxides and sulphur dioxide can make a person ill if they exist in concentrations any higher than ten parts in 1,000,000.

But of all fire's gases, acrolein is the most villainous; one part in 1,000,000 of air is all you can breathe with safety. That's the reason you automatically throw open the windows when fat catches fire on the stove—your lungs demand air.

Don't fiddle with fire. Air that becomes superheated is dangerous in itself. It spreads fire. Fire doesn't have to travel from curtain to armchair to piano bench and thence to a door. Get any combustible material hot enough and it will burst into flame. Wood shavings burn at as low as 442°—lower if heated for a long time. And if you've wondered, the tip of a lighted cigarette generates 900°.

Fire protection for the home thus is largely a matter of using the family's collective head. Asked for an easy formula for fire prevention, one fire department chief replied dourly: "Don't go around looking for a gas leak with a match."

That's another way of saying, "Don't be careless."
END

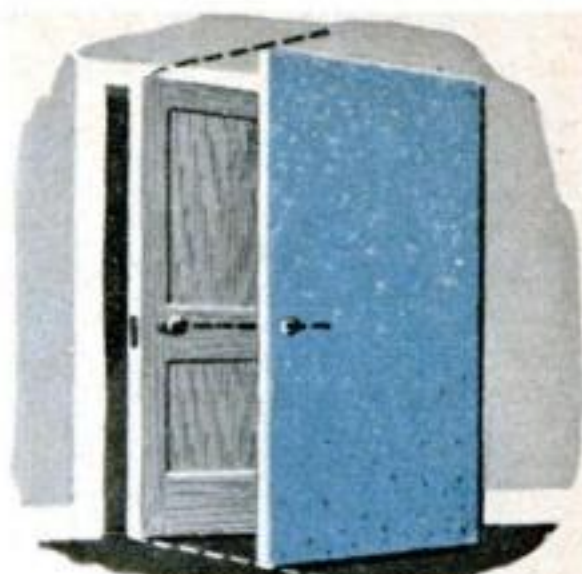
IN CASE OF FIRE

1. Get everybody out of house.
2. Call fire department.
3. Close all doors and windows in reach.
4. Fight fire without taking chances.

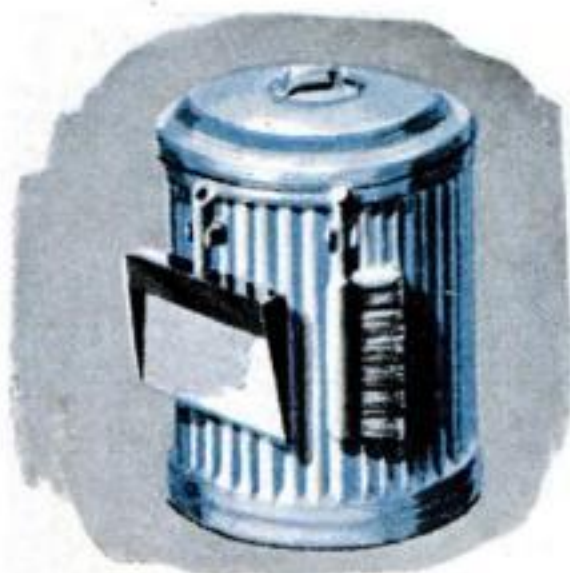
Fire- Prevention Projects for the Home Workshop



Metal cup filled with salt or baking soda provides simple fire protection around kitchen stove. Keep it handy to douse grease or fat fires. To prevent caking, put on a moisture-proof cover and rip cord, then seal the cup with plastic tape.



Gypsum board or fire-retarding wallboard screwed to basement side of door may buy time for you until firemen arrive. Half-inch gypsum board has fire-resistance rating of 15 minutes. Even whitewash will retard fire for a short time.



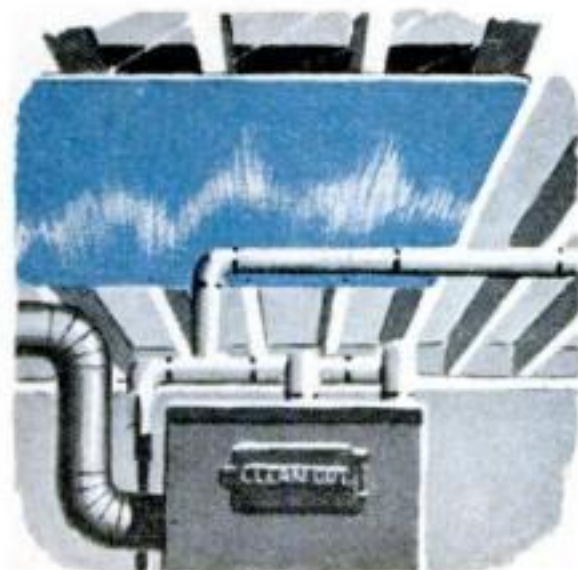
Sawdust, shavings, and chips around home workshop are fire hazard, especially if homeowner smokes while working. Clipping brush and dustpan to metal disposal can is a good reminder to clean up combustible litter promptly.



Outdoor antennas, now back in favor for FM and television, increase the possibility of fire being started by lightning. Simple arrester, with terminal wire run into ground or attached to buried pipe, offers inexpensive fire insurance.



Stored gasoline is best kept outside the house or garage. Put that fuel for power lawnmower or outboard motor in a special housing with access to open air. Be sure to put vent at bottom of box to prevent the accumulation of fumes.



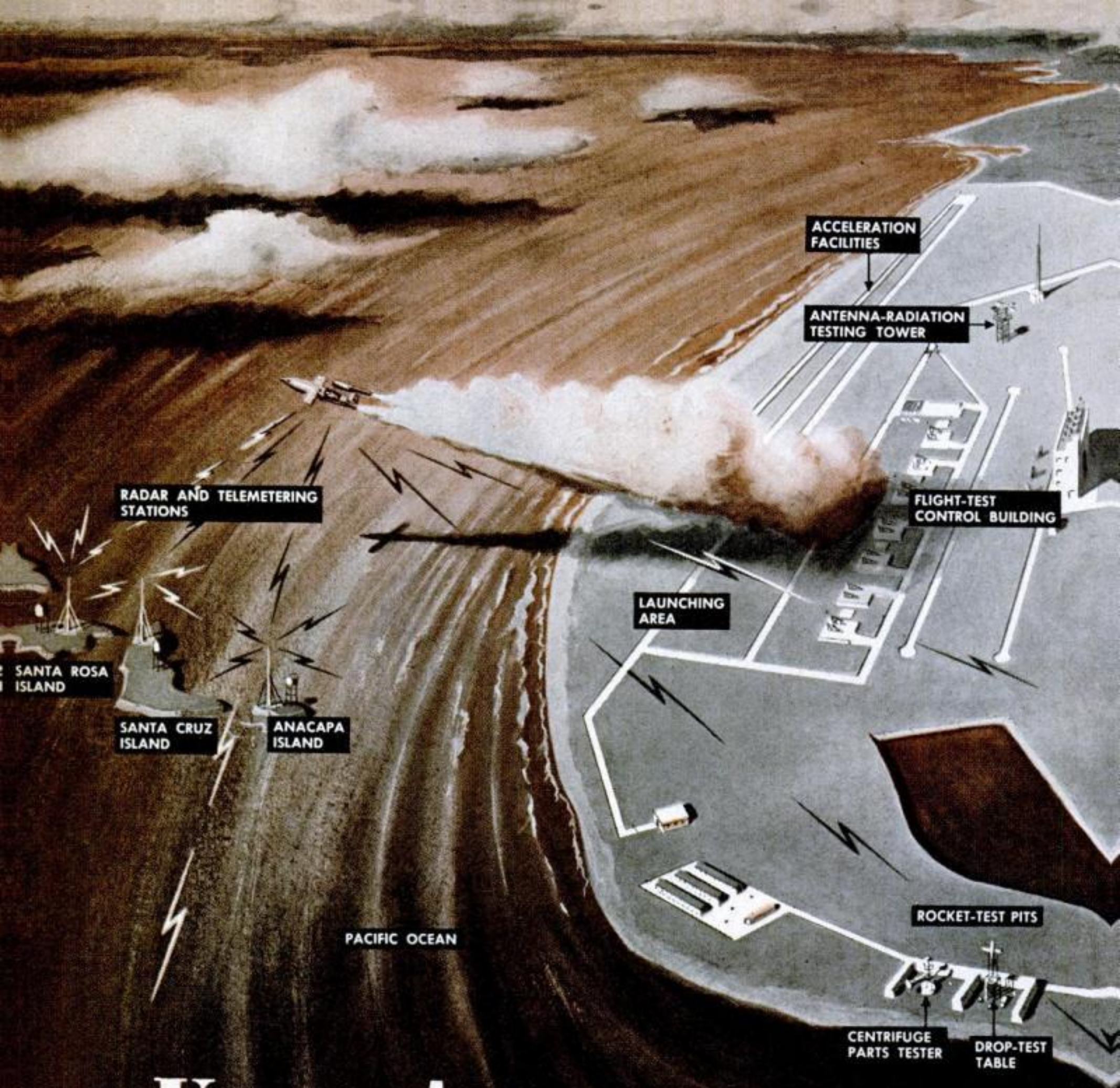
False ceiling of asbestos sheeting or gypsum board over furnace insures against instant firing of tinder-dry joists and flooring in case of blowback and sudden flames. Ordinary fiberboard retards fire only a third as long as asbestos.



Rock-wool batts stuffed between basement joists are highly fire-resistant. Covering them with $\frac{1}{2}$ -in. gypsum board makes ceiling with fire-resistance rating of full hour. Gypsum plaster on metal lath is an equally good covering.

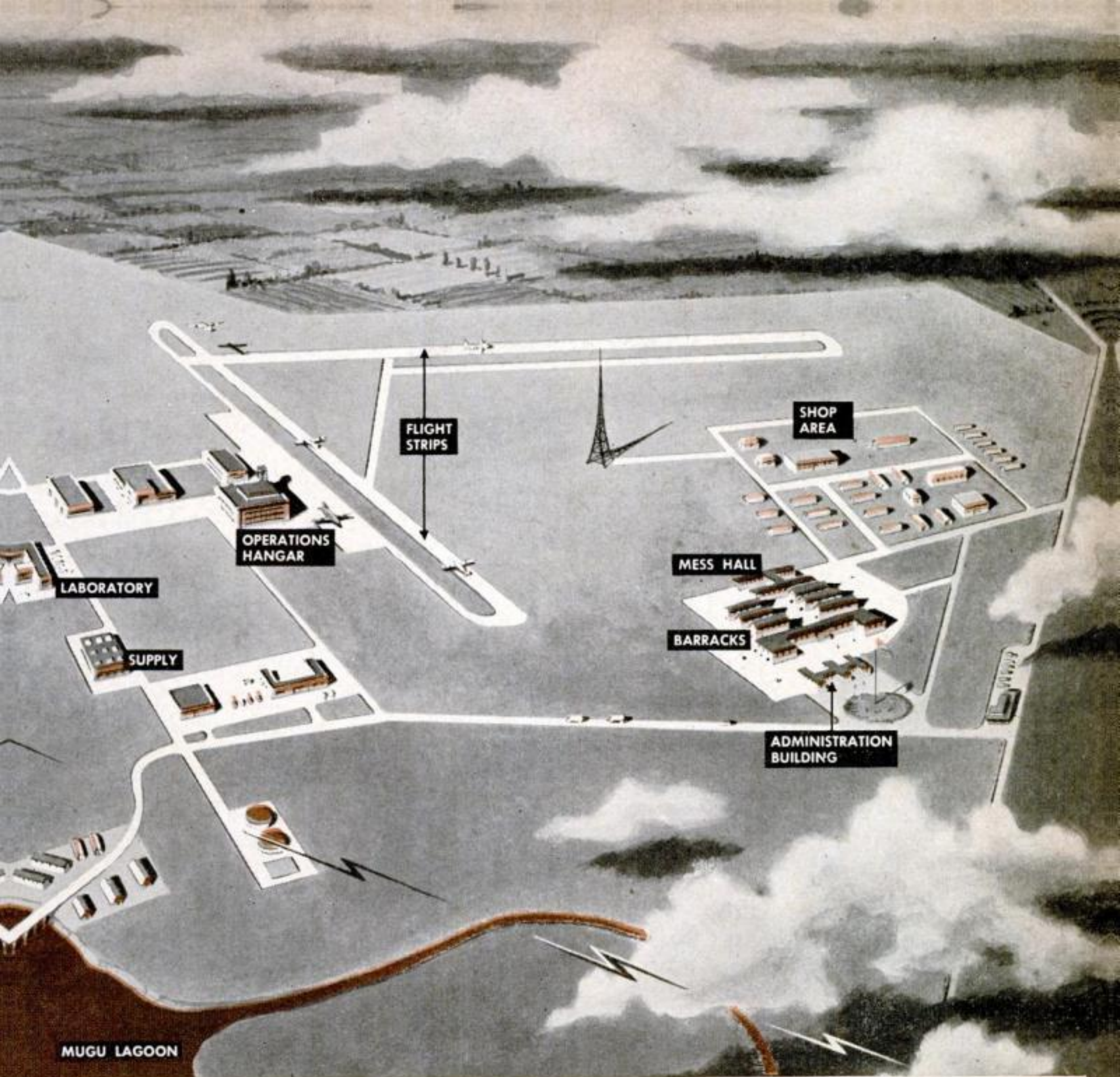


Bucket of sand on bracket in basement is ideal emergency weapon for home fireman. Sand smothers flames, is especially effective against fires from flammable liquids. Put bracket low enough for all members of family to reach.



Keep Away from Point Mugu!

The Navy's test station for guided missiles is being made into the world's biggest proving ground for weapons of push-button war at sea.



By Andrew R. Boone

THE young Naval officer jabs his red pencil at an air map of the California coast. That red dot is now a pin-point target. Its exact position, 100 miles or farther out in the Pacific Ocean, is calculated.

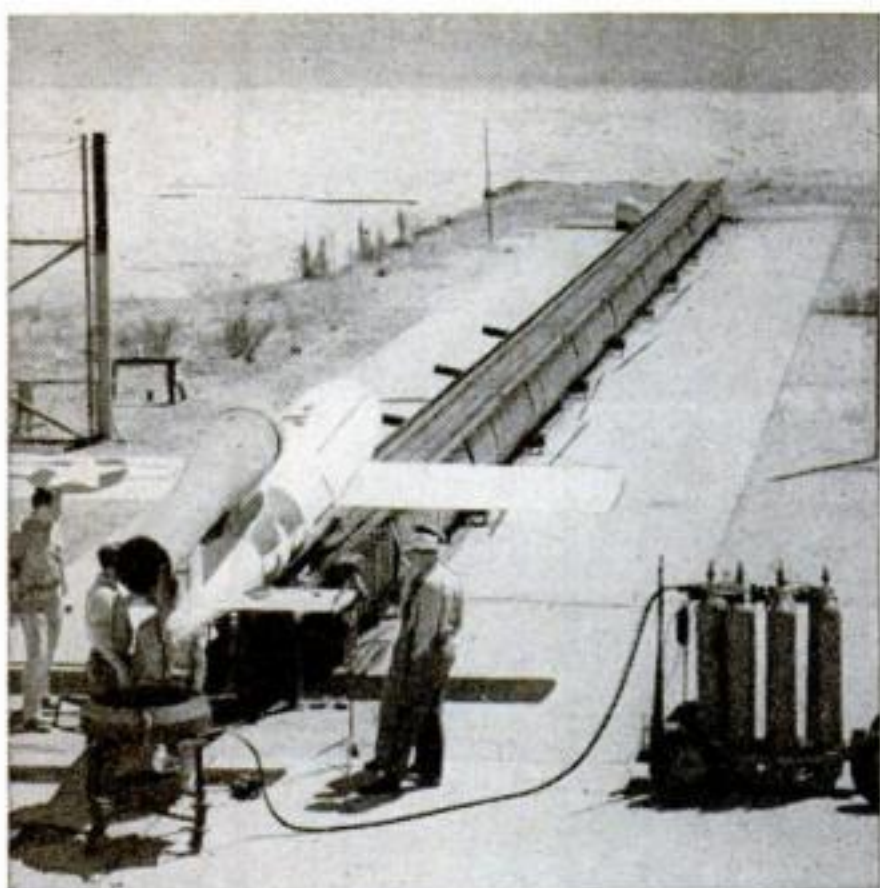
Soon, one of the Navy's secret guided missiles roars from a launcher and arcs high into the sky. If its electronic brain responds swiftly and surely to radioed commands, the missile will plunk into the sea on or very near its mark, far over the horizon.

"At least," the launching control officer tells you, grinning, "we'll scare a helluva lot of sea gulls."

Hitting tiny targets 150 miles away, far

beyond the horizon, is serious business with the Navy's Air Missile Test Center experts at Point Mugu, Calif. Since the station began operation Oct. 1, 1946, hundreds of missiles have smoked seaward. Upwards of \$15,000 drop into the drink as each ends its flight. In time, improvements from these launchings will bring guided missiles that can be fired from surface ships with the accuracy of a 16-inch rifle—but with far greater range and destructive power.

The Navy isn't shooting fireworks for fun. These experimental missiles are not rockets, but miniature planes with wings. They carry instruments that receive their guidance from within, or from a remote station—on land, ship, or plane. They fly toward one of sev-



Guided missile is about to be launched from an improved version of the "split-tube" type catapult used by the Nazis. Lighter, it uses powder instead of hydrogen peroxide as a propellant.

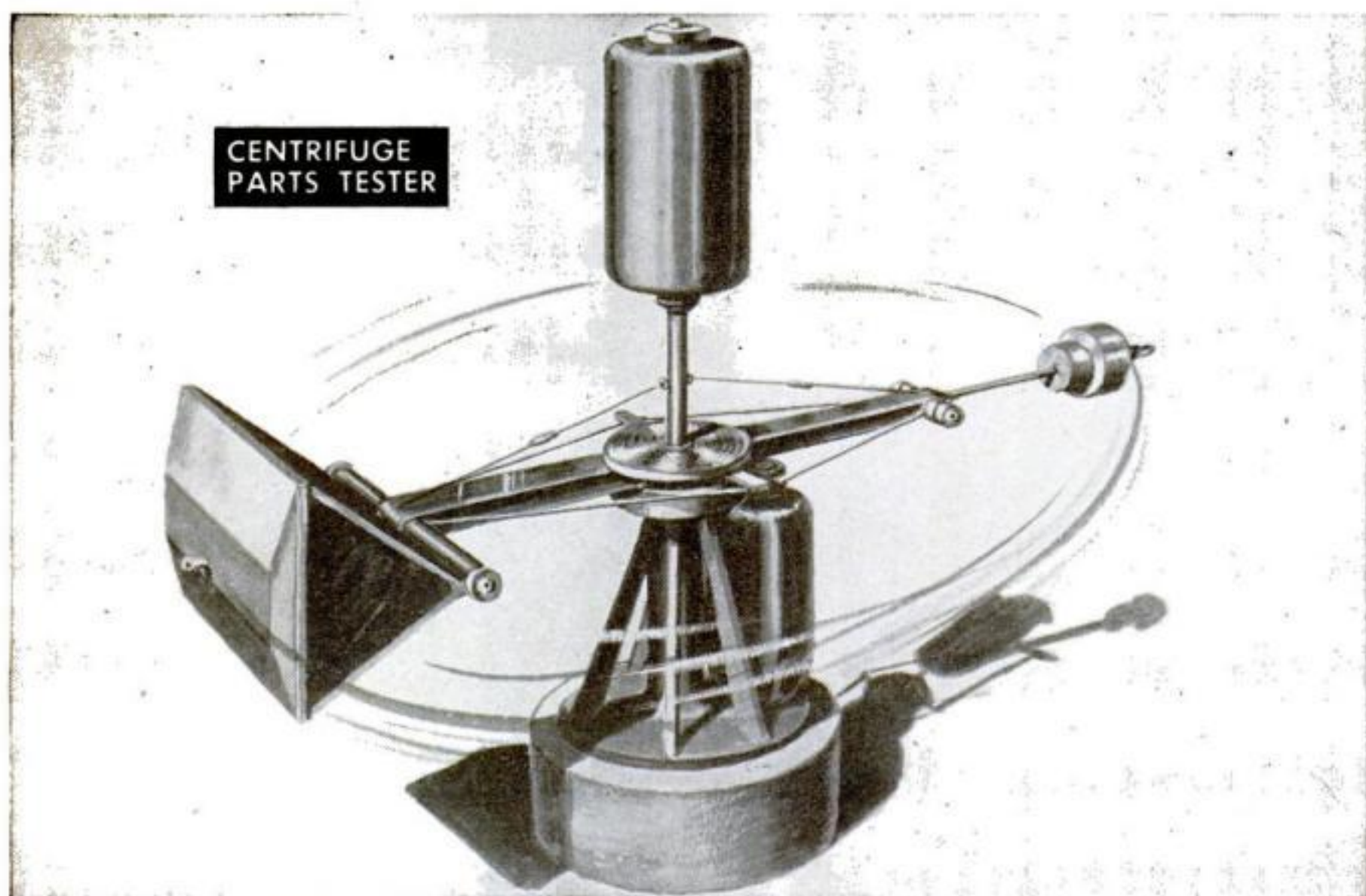


For tracking the missile in flight, this theodolite, pointed seaward, is another improvement over a German original. At Point Mugu it has been modified to permit faster sweeping.

eral islands forming a natural V out in the Pacific. On all the islands are observation stations, in constant touch with the mainland by radio, radar, and other means of communication.

By tracking a missile from several points,

it's fairly easy to determine its position in space throughout a flight. At the same time, the missile telemeters back to headquarters a running account, reporting with a series of dots and wavy lines exactly how it functions, from the temperature inside its com-



Components of new missiles must stand up under tough tests in this proposed centrifuge. Whirled by a 75-hp. electric motor at 198 r.p.m.,

it will submit parts to a load of 100 G. The swirling container, balanced by a weight, can hold a package 3 by 3 by 2 feet in size.

bustion chamber to response of the rudder to radioed commands.

Point Mugu has been operated for some time as a temporary base. Now it's going to work in earnest. Recently, Congress authorized the Navy to spend \$30,000,000 on construction to keep it ahead of all comers in this field. Within three years it will grow into a huge control center outfitted with the latest in radar and other tracking devices. Scores of workers will be supervising flights from a battery of launchers. In time, as many as 96 launchers may be installed. Elsewhere on the 7,000-acre station, shops and test facilities will continue to perfect missiles and components made by manufacturers to Government specifications. Only the best will join the fleet.

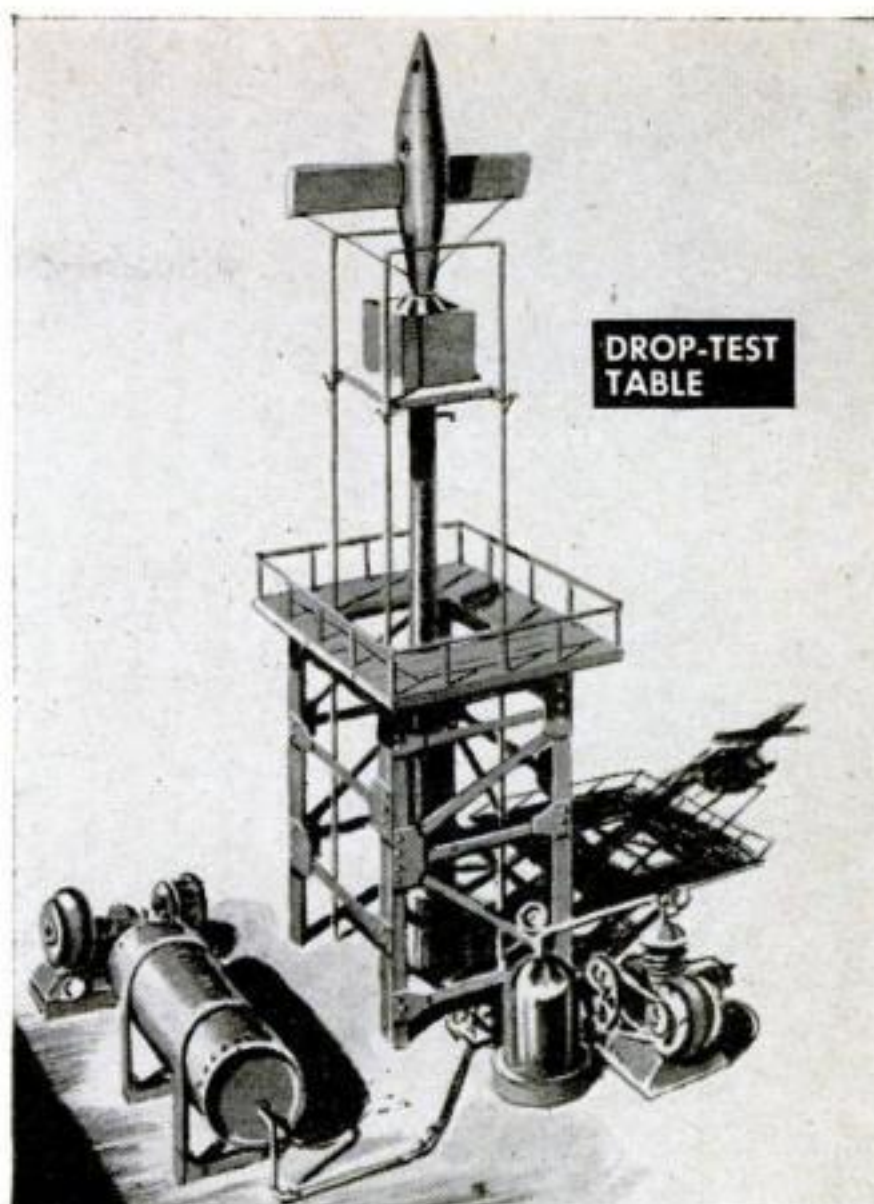
Tests for Fitness

Right now, the engineers and workshopers are laying plans with ingenious gadgets to improve the aiming of missiles still under wraps. You will read about some of these in months to come, but not until the Navy knows their delicate innards can withstand the severe shock of sudden take-offs from the launchers; that they will respond instantly and accurately to remote control; that they will hit their targets with more than a fair degree of accuracy and reliability.

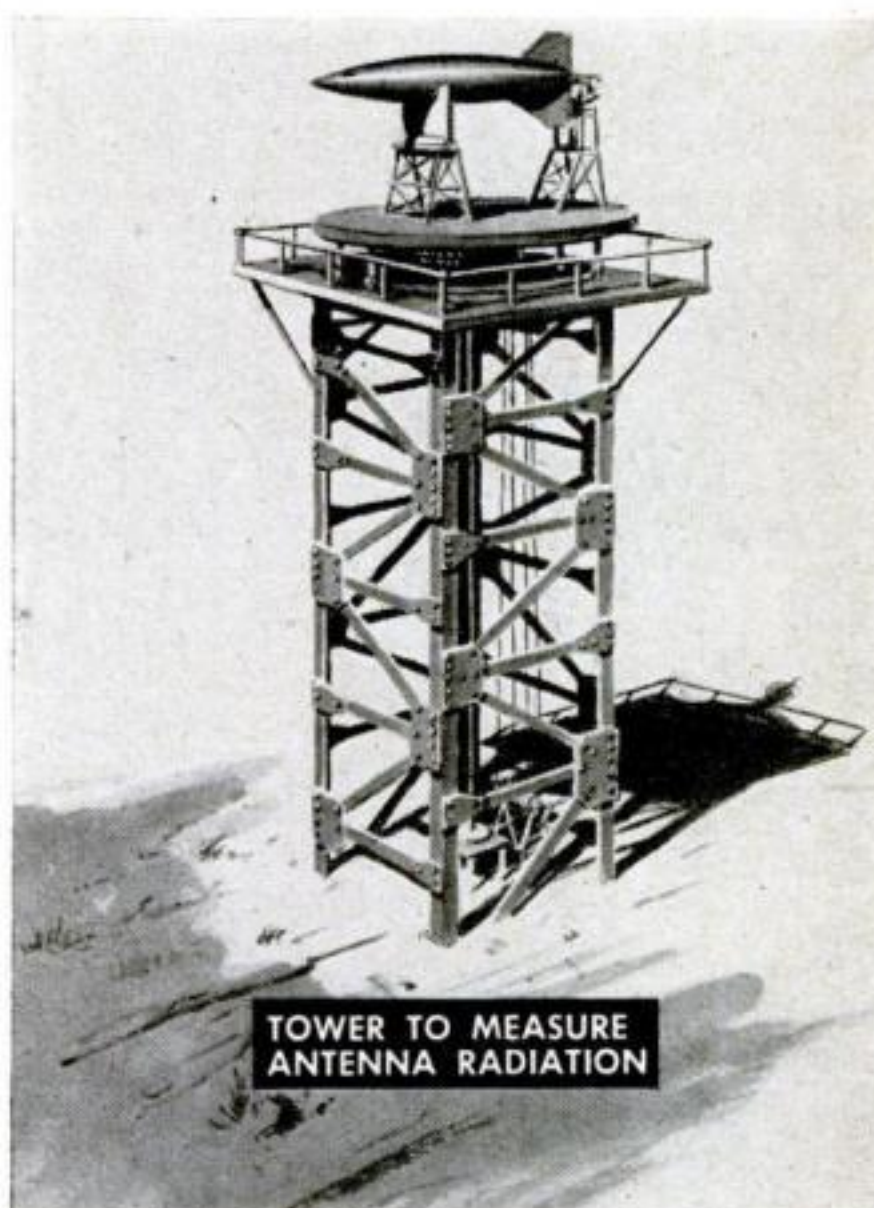
In the Point Mugu shops and along the shore, experts soon will be working with a trio of machines that will submit new weapons to grueling punishment. If the electronic brains and other controls housed in guided missiles can't take it, and be ready for more, they will be either toughened or discarded.

They're dropped in one test. Mounted on a piston, complete medium missiles, such as the buzz bomb, will be dropped 10 feet and jerked to a stop in $3/100$ of a second.

But missiles must withstand even greater stress before they're pronounced fit to be launched. A mighty little centrifuge will submit assemblies to a pull 100 times greater than the force of gravity. And then there'll be an even tougher test, known as linear acceleration. Take a compact little package weighing 200 pounds and place it on a simulated launcher. Say it contains the controls that will actuate a missile's rudder and elevators. Place it within a torpedo-shaped form, and lay it on its side in a sled at one end of a steel track about a mile long. Now hit it with the blast of high-powered rocket motors. Almost as quick as a wink, this lit-



Dropped 10 feet in device sketched above, complete missile will be brought to a stop in $3/100$ second. Tester will be built to check reaction at deceleration loads up to 20 G.



To determine antenna radiation patterns, missiles will be mounted on a tower like the one shown above. The missiles may be rotated 360° horizontally, or rolled 90° from level.



An F-80 Shooting Star jet fighter takes off in pursuit of each missile that is launched. The pilot's job is to shoot down those that misbehave by turning back toward shore, not

responding to commands, or flying beyond the designated target area. Already more than one of Point Mugu's winged missiles have gone into the drink under fire from the guardian fighter.

the runaway, accelerating at hundreds of G, will pass the sonic barrier.

Although rushing down the track nearly three times faster than sound, the assembly must be halted, swiftly and safely, so that the effects of acceleration may be evaluated. For this purpose, brakes of some type, possibly water scoops, must be developed.

Thus the missile withstands battering and shocking starts and stops. How efficiently and over what range will it transmit and receive signals? To find out, missiles weighing a full ton will be mounted on a 50-foot, non-conductive tower, made of wood or plastic. As the missile is turned a full 360 degrees and rolled 90 degrees from level, the radiation pattern of its antennas will be charted by electronics experts in a test room a mile distant. When a missile of the same configuration takes off on a 150-mile flight, its transmitting and receiving ranges in all directions will be known.

Five classes of missiles are being developed:

Ground-to-air, like the interceptor airplane, is fast and of short range. It is intended to knock down incoming aircraft or missiles.

Air-to-ground takes over the bomber's functions for destruction of enemy ships, military installations, and other primary targets.

Air-to-air serves the same function as the fighter plane.

Ship-to-ship suggests the torpedo plane. This missile would go in low and fast.

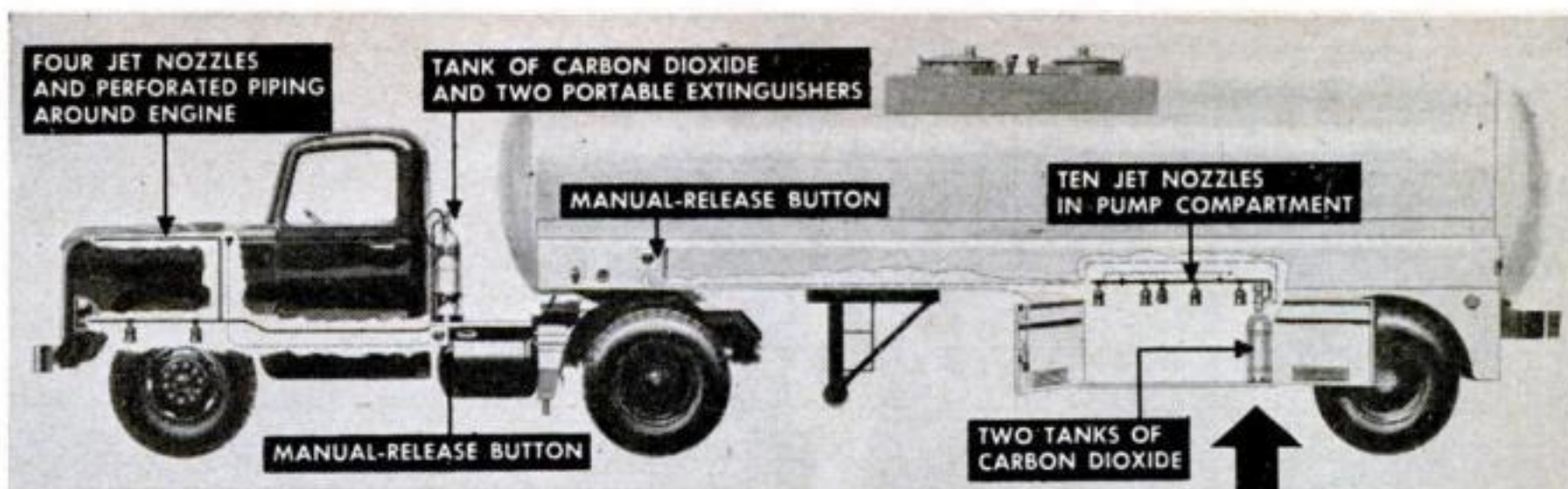
Ship-to-shore, flying in a long, high trajectory, becomes a high-level bomber.

The Navy expects to continue employing ships as fighting bases for a long time to come. Point Mugu missileers envision the necessity of launching their weapons from rolling decks, in fair weather and foul. When a new missile arrives at the base under wraps, eager minds begin to throw questions. Can it be launched? Once off a catapult, will it fly? If it flies, will it respond to remote control? Finally, how must the flame-belching weapon be discharged from a surface vessel to insure an accurate trajectory—and a hit?

Out on the wind-swept island of San Nicholas in the Pacific, some 63 miles from the Naval Air Missile Test Center, the Navy maintains a staff of approximately 50 people. From this island they obtain information to aid telemetering the progress of flight and performance of the missile. In the not too distant future, it will be used as a site to launch missiles that are considered too dangerous to launch from shore installations at Point Mugu.

Thus guided missiles are being groomed for a big future with the fleet.

Just how big, you're told, depends upon the scientists, the weather, and the dogged, day-by-day, try-'em-and-fly-'em project assigned to the men of Point Mugu. **END**

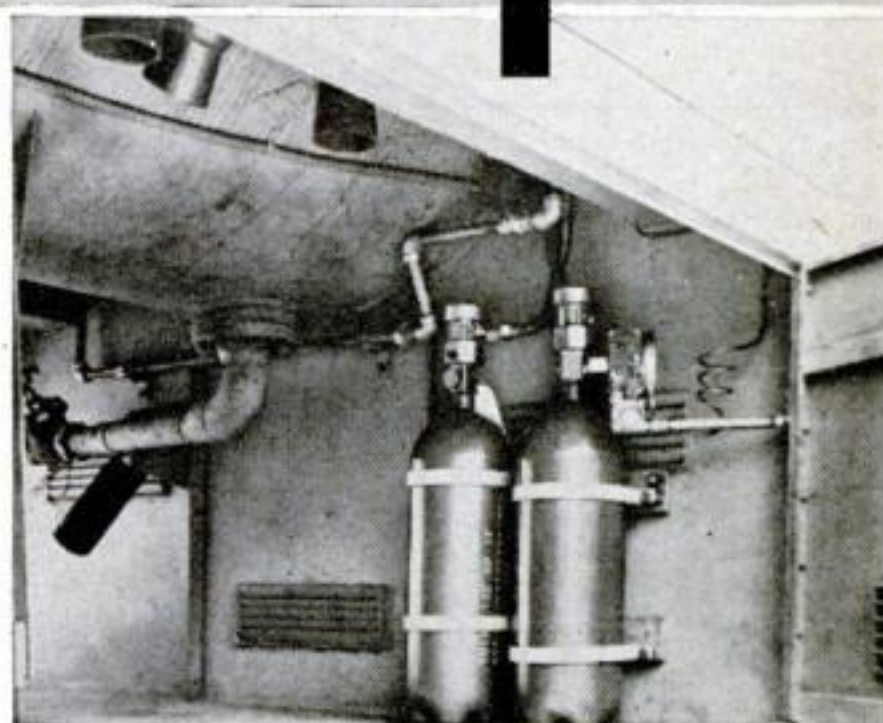


Tank Truck Carries Its Own Fire Department

TWO separate sets of automatic CO₂ fire extinguishers, similar to those now installed on many airplanes, ships, and motorboats, stand ready to smother a fire before it can spread in this 4,000-gal. tank truck.

The big trailer truck was designed for bulk transportation of propane, a flammable gas kept liquefied under pressure. The fire-protection system, developed by Walter Kidde & Co., is believed to be the largest installation of its kind.

One set of extinguishers protects the engine; the other, shown at right, is in the pump, meter, and hose compartment under the trailer. Together they include three 20-lb. tanks of carbon dioxide, 14 multijet

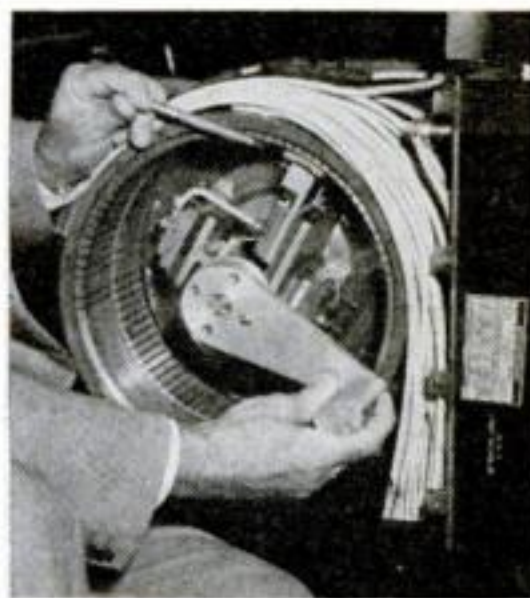
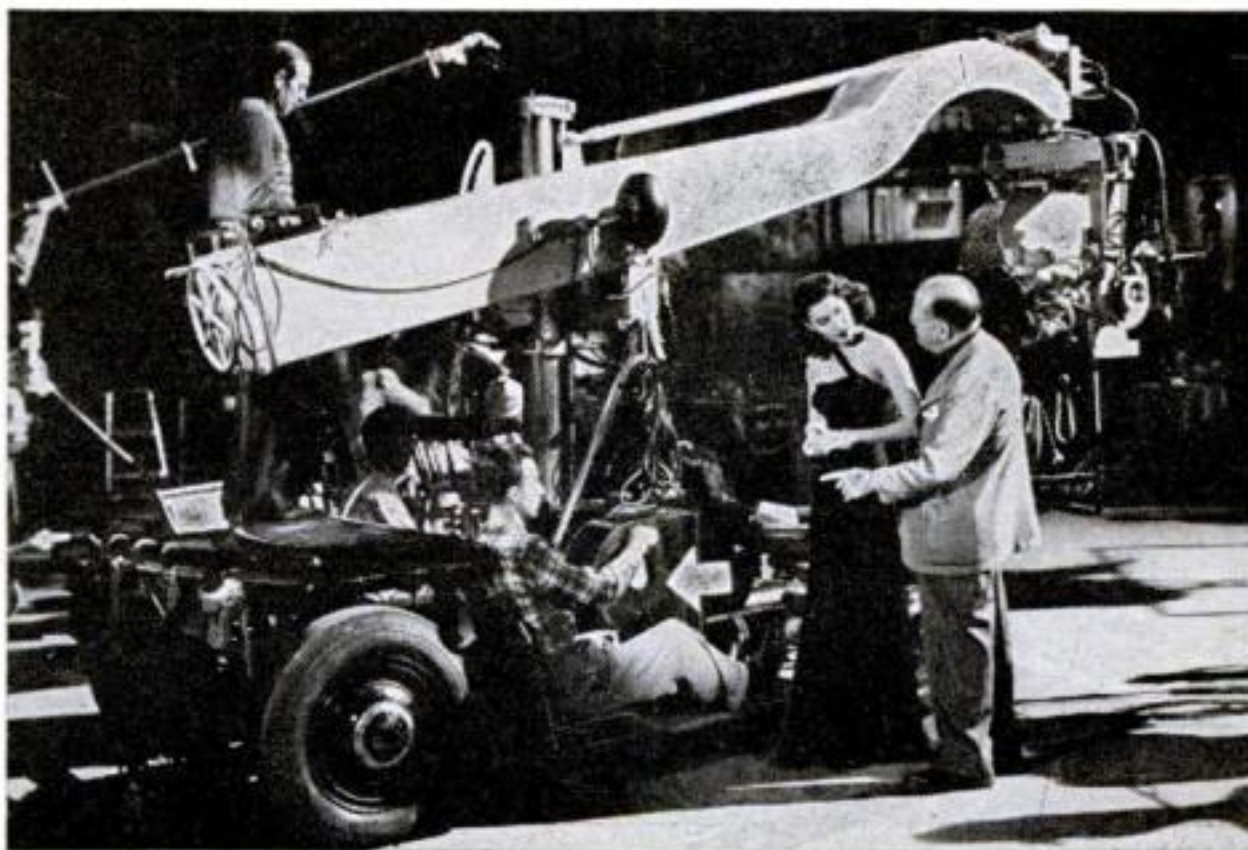


discharge nozzles, several feet of perforated piping. Both are triggered automatically by heat detectors and can also be released manually. In addition, two portable CO₂ extinguishers are carried behind the cab.

Motorized Boom Speeds Shifting of Movie Camera

THIS self-propelled camera boom saves time between shots in making movies. One man sitting at its single control—instead of a whole crew pushing—can shift it forward or

backward at any of 40 speeds and as little as a quarter of an inch at a time. The new car was developed by John Arnold, head of Metro-Goldwyn-Mayer's camera department.

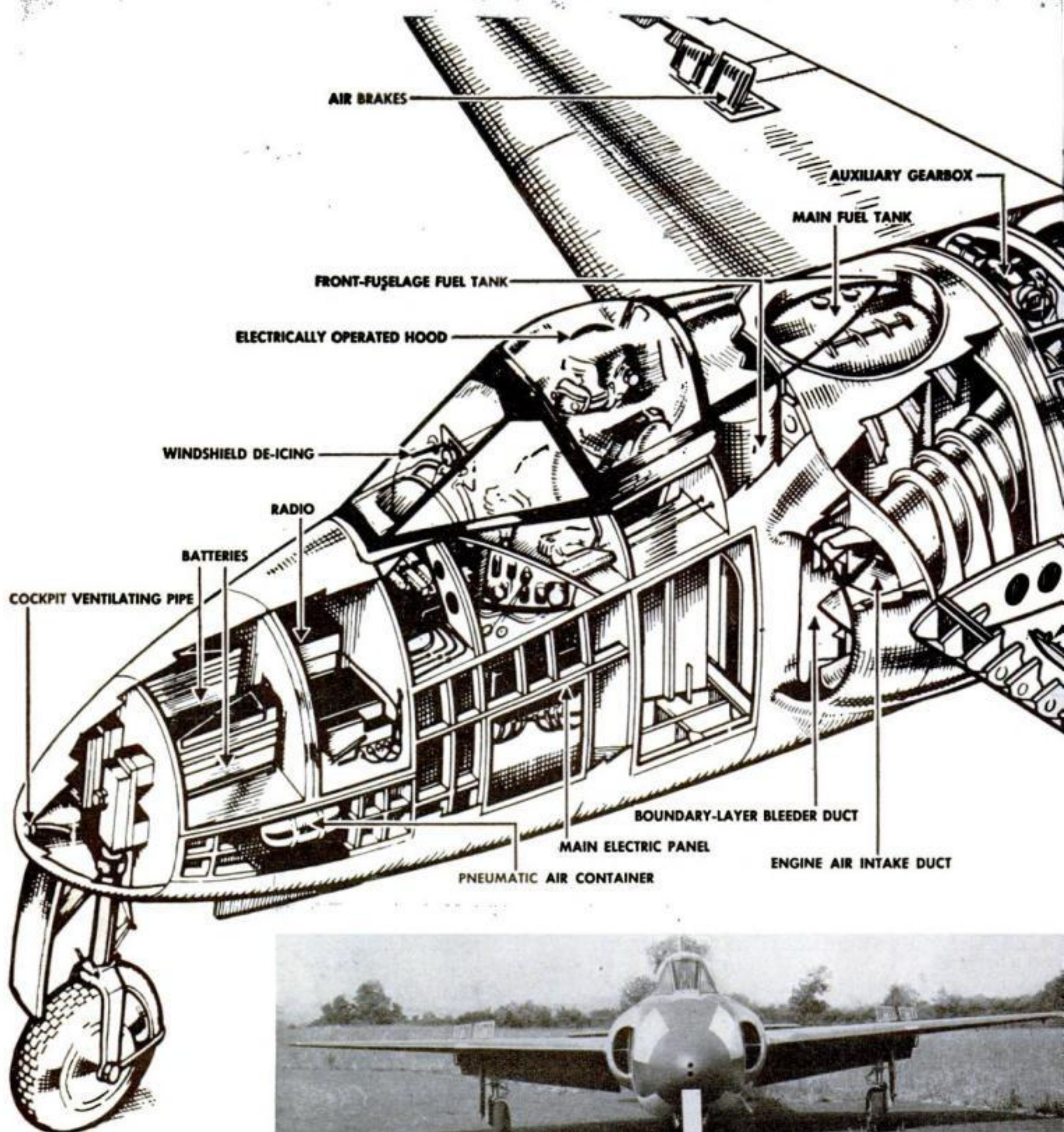


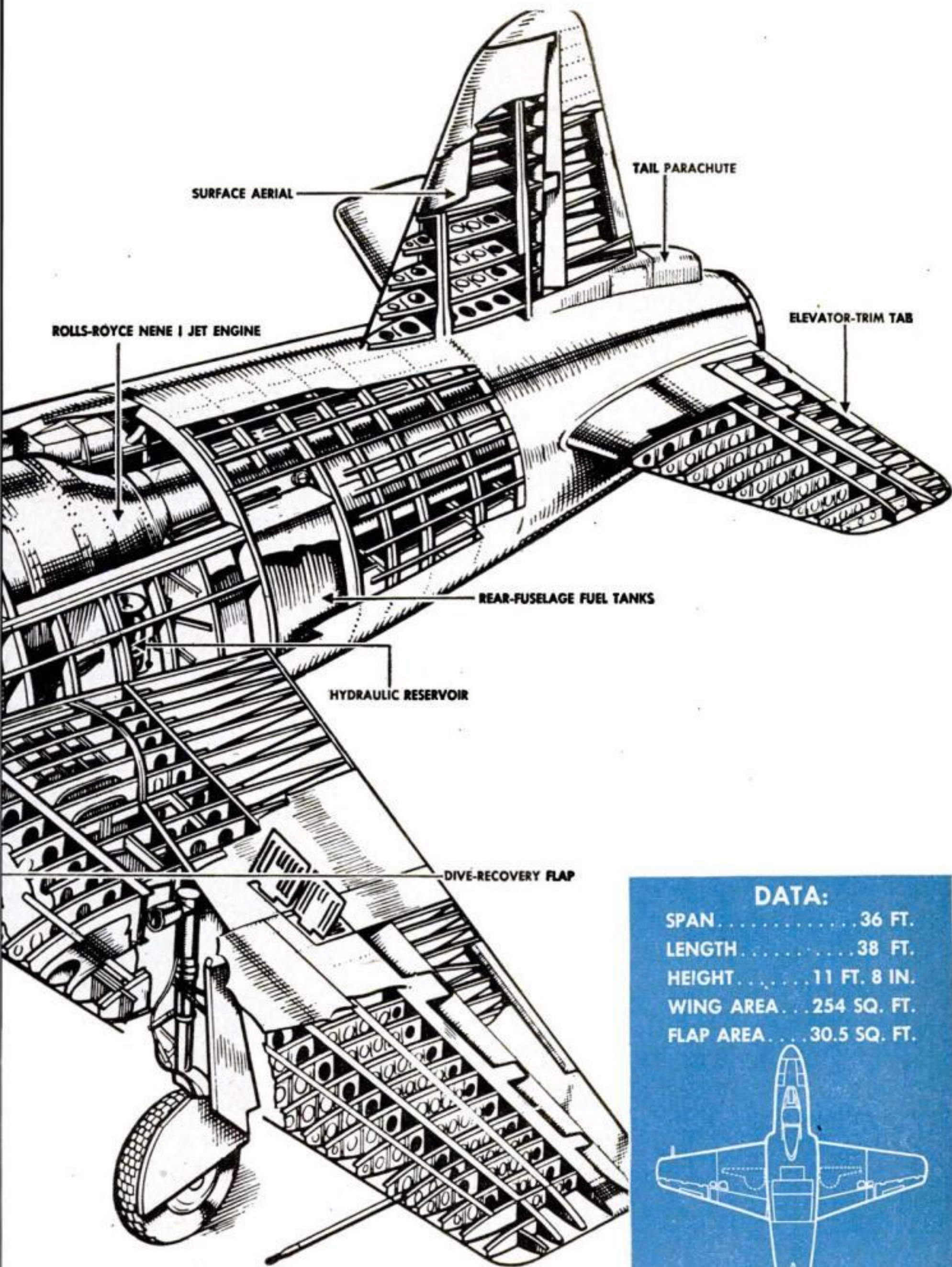
Throttle is rotor-and-stator similar to a streetcar's controller. It varies speed of 10-hp. motor geared to wheels through an automobile-type differential and rear axle.

Inside Britain's Newest Jet

KNOWN simply as the Gloster E. 1/44, Britain's newest jet fighter may take the laurels away from the record-breaking Gloster Meteor. Although it has been flown, no performance data have been re-

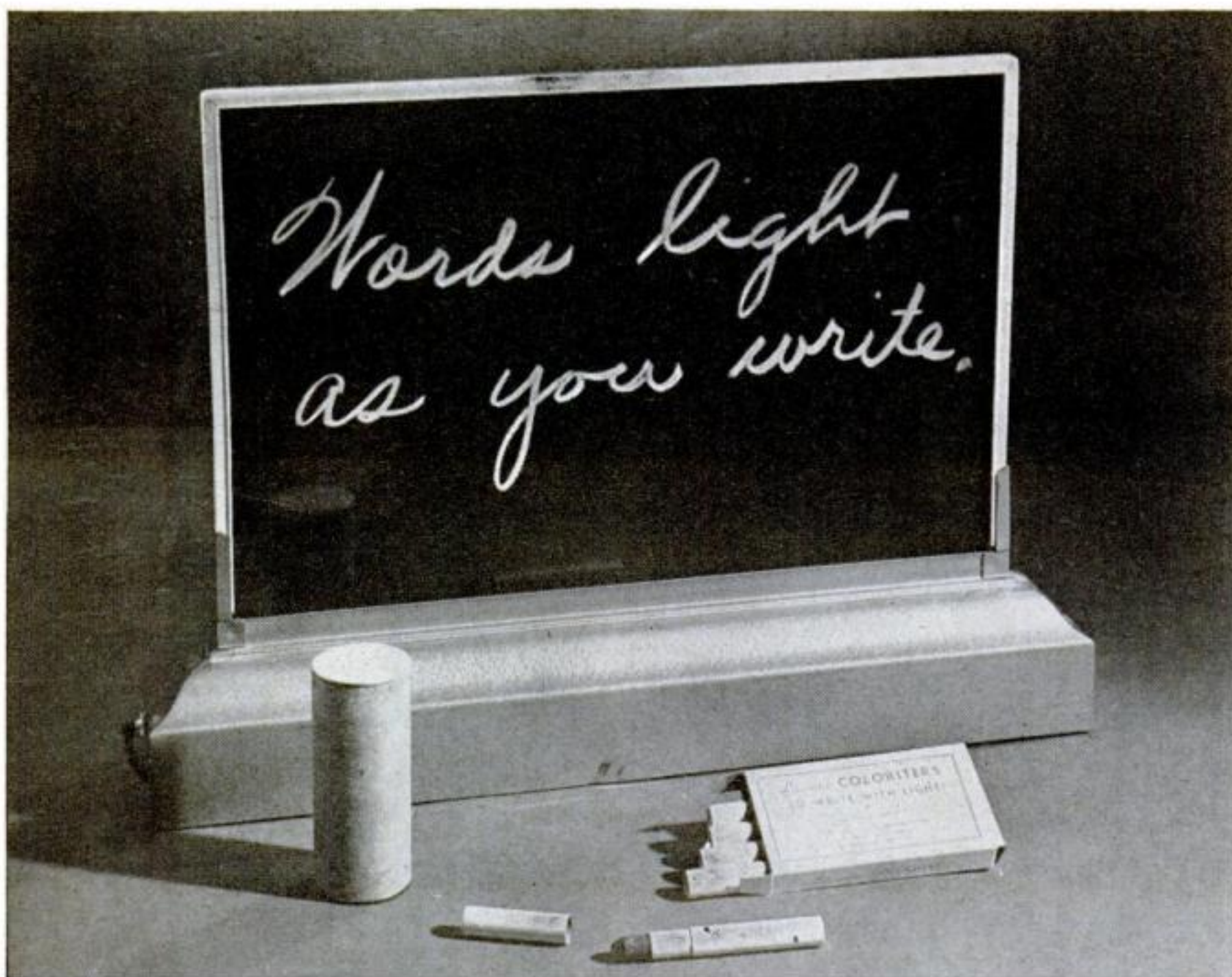
leased. Powered by a single Rolls-Royce Nene turbojet engine of 5,000 lb. thrust, it breathes through twin "nostril" intakes. The cutaway below shows the design problems involved in building a jet fighter.





Drawing Courtesy Flight, London





THIS sheet glows like a neon sign—but you can write any message you like on its glass surface with a special crayon or water colors. Edge-lighted from below by a 15-watt fluorescent tube, the lettering stands out

against a sheet of black cardboard behind the glass. To change it, you simply wipe off the old message with a damp cloth and write on a new one. Litewriter Corp., of New York City, makes the sign.



Plastic Belt Holds Voice

A SECRETARY can keep up with dictation while the boss is away on business if he takes along this new Dictaphone Time-Master®. It weighs only 20 lb. and fits snugly into a suitcase. Instead of wax cylinders, it records on endless plastic belts. Each holds 15 minutes of dictation, and five of them can be mailed in an envelope for 3 cents.



"Pipe" Kills Insects

RESEMBLING a smoker's pipe, the device above is actually an insect killer. When plugged into an AC or DC outlet, it turns a cake of DDT—contained in its cup—into microscopic particles. These are carried by air currents and deposited on surfaces in the room. American Aerovap, Inc., of New York, rents the vaporizer to users.

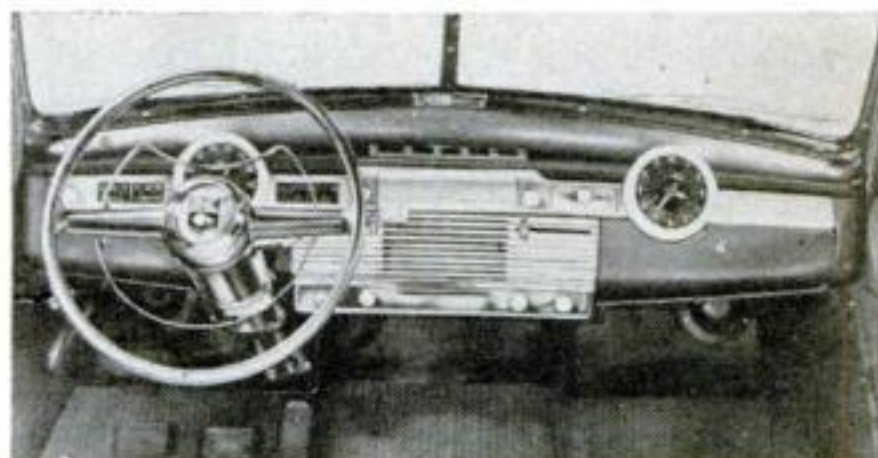
New Kaiser Car Has More Power

GREATER horsepower with no increase in gasoline consumption—that's the boast of the new 1949 Kaiser De Luxe. Adoption of a dual-throat carburetor and a dual manifold system gives a 112-hp. performance where there was only 100 hp. before, and without increase in displacement or compression ratio. This refinement, it is claimed, enables the car to accelerate from 10 m.p.h. to 70 m.p.h. in 29 seconds.

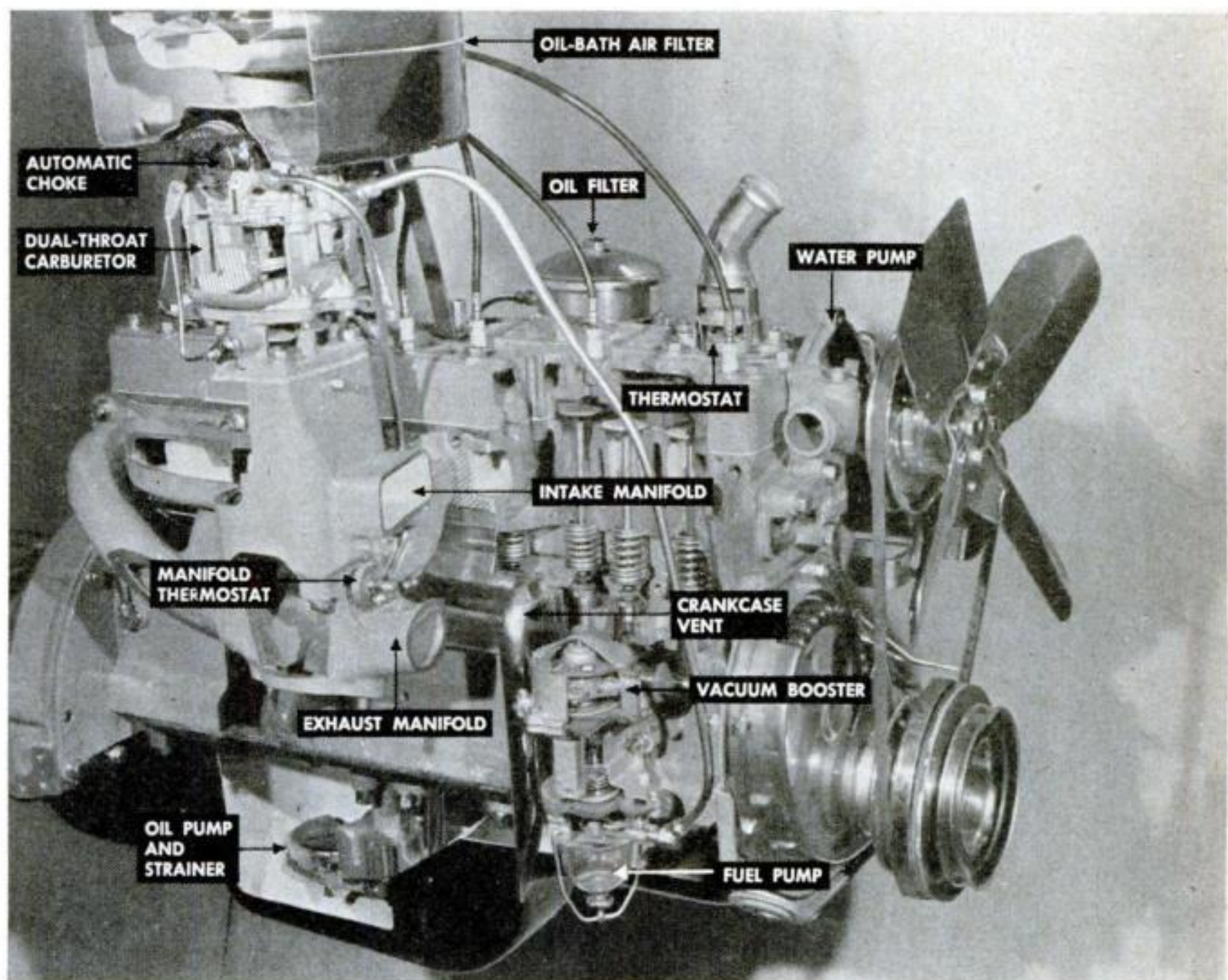
Each half of the carburetor, acting as a single complete carburetor, supplies a fuel mixture to three of the six cylinders. This makes possible a closer control of the mixture and reduces resistance to flow. Each half of the dual manifold also supplies charges to only three cylinders. Individual passages, partitioned to prevent interchange of unvaporized fuel between passages, provide a free flow to and from cylinders.



Lower in appearance, the 1949 Kaiser has a grille of massive, parallel-bar construction.



Completely redesigned dashboard features dial-type speedometer and edge-illuminated plastic numeral rings on all instruments. A map light has been added to the steering column.



An L-head six-cylinder engine powers the new Kaiser De Luxe models. It is claimed to have

the highest rated horsepower per cubic inch of piston displacement of any such engine in U. S.

What's New in Aviation

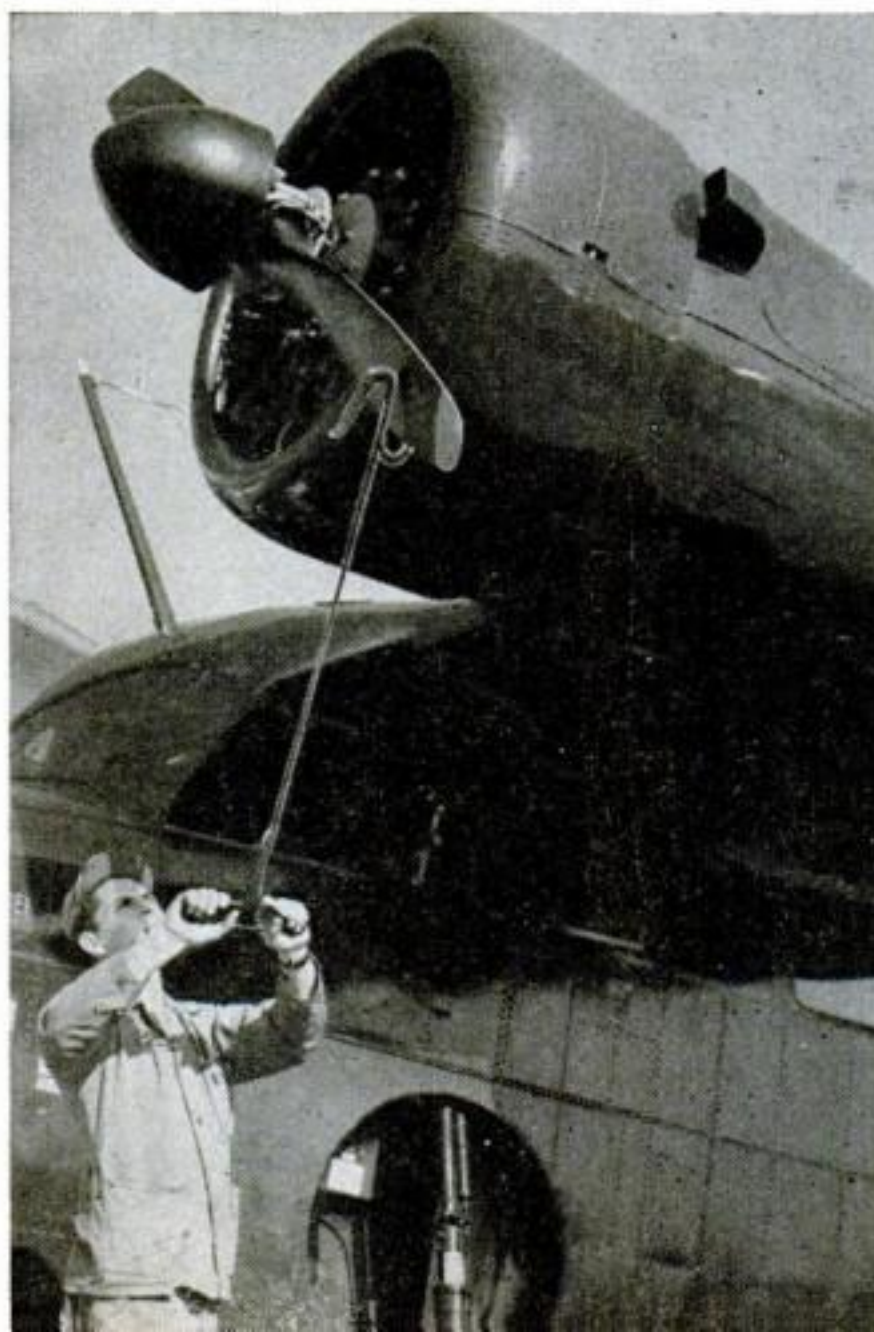
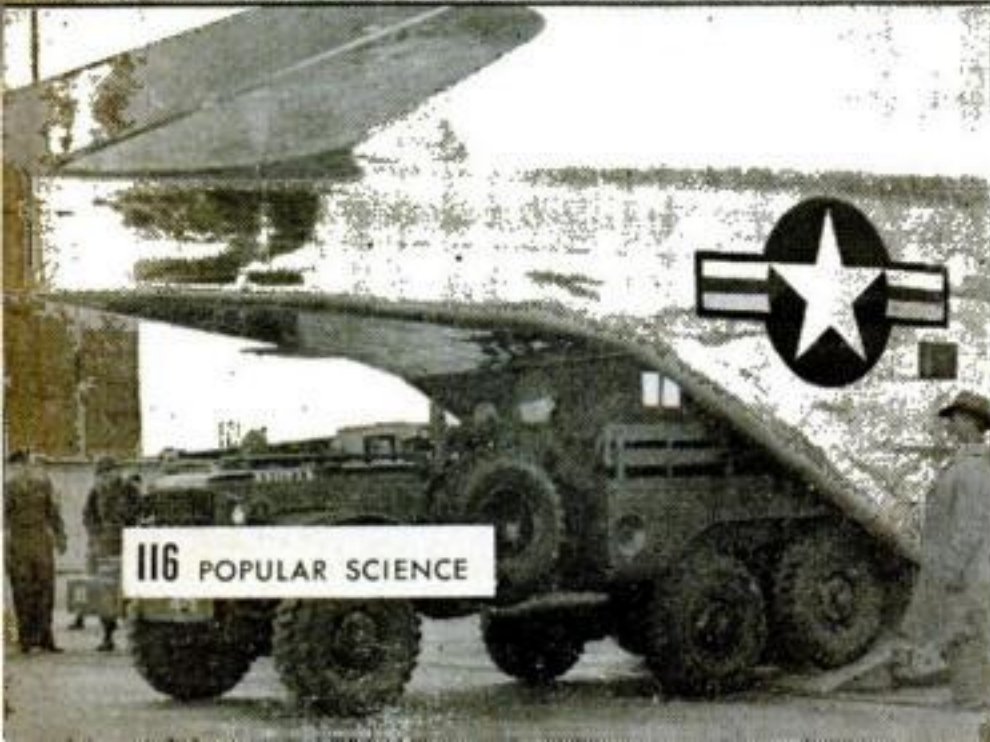


Jet Joins the Air Lines. The world's first all-jet-propelled passenger airliner is shown above about to land at a London airport after a 200-mile, 34-minute flight from Paris. The airframe is that of a standard Vickers Viking transport, with the wings

adapted for the installation of two Rolls-Royce Nene jet engines developing 5,000 lb. of thrust each. In a previous experiment, the British installed two Nene engines in a four-engine Lancaster; the other two were reciprocating engines driving propellers.

Glider Built for Cargo. The new XCG-18 Air Force assault weapon shown below is the boxcar of gliders. Photo at bottom shows a truck being backed up a loading ramp into a hold 24 feet long, six feet high, and almost eight feet wide. Called the Avitruc, the all-metal Chase glider can carry 8,000 pounds of cargo, 30 fully equipped combat troops, or 24 litter patients. The extremely thin wings simplify towing, and a communications system is provided between the motorless craft and its tow plane.

Prop Gets Dry Run. The crew chief below is demonstrating the use of a home-made pull-through bar, used to haul the propeller around by hand. This manual turning is routine to clear out engines prior to starting, and to make sure there is no hydraulic block in the feathering mechanism. The S-shaped tip of this bar makes it easy to reach propeller blades mounted above a high wing, as in this Marine Corps plane. The ½-in. steel shaft, 40 in. long, is welded to the gripper, bent out of a 30-in. bar.

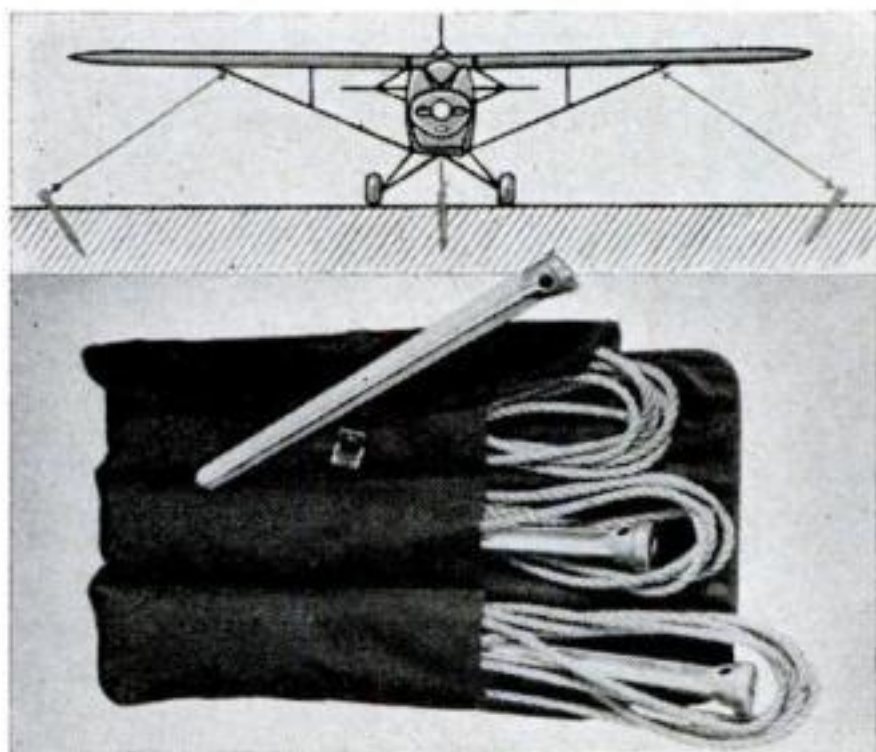




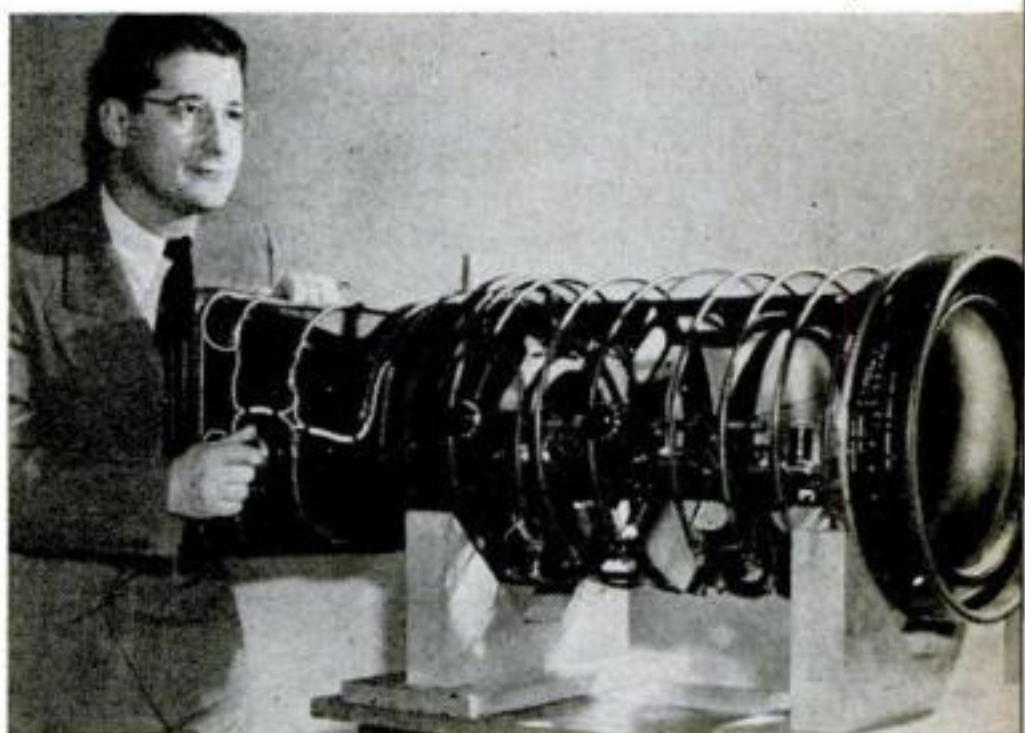
Trainer Previews Jet Flight.

With a speed of almost 300 m.p.h., the new Air Force trainer shown in the artist's sketch above will prepare student pilots for the high velocities of jet-propelled aircraft. Powered by an 800-hp. Wright engine, the T-28 has

a service ceiling of 31,650 feet; its gross weight is 5,862 lb. It is the first U. S. trainer with tricycle landing gear. North American Aviation will build 268 of the planes, which will be used for both primary and basic flight training of Air Force cadets.

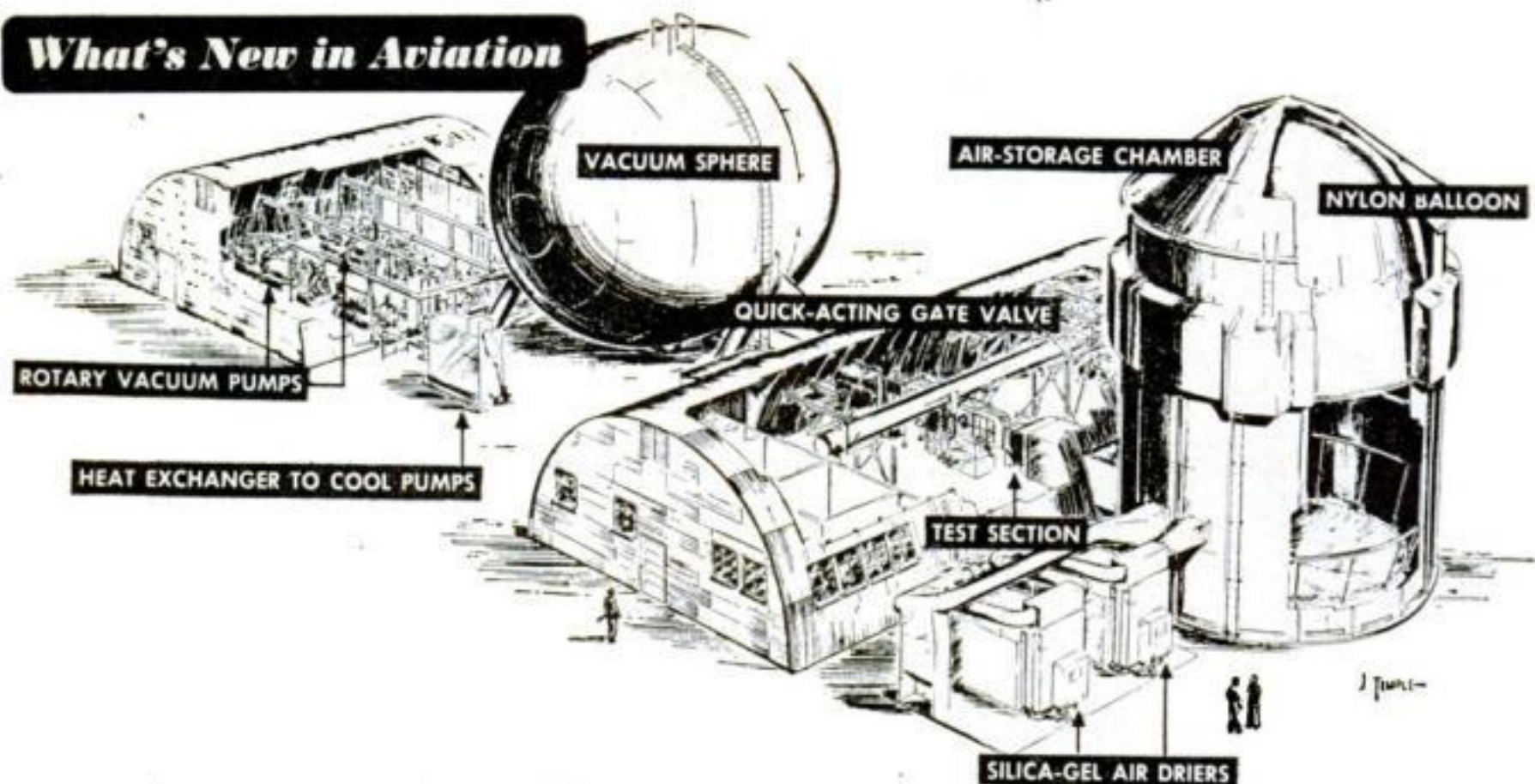


Tie-Down for Light Planes. The compact, four-pound kit shown above contains all you need to moor any light or private plane. It consists of three aluminum-alloy stakes and three lengths of rope. The 15-inch-long stakes have star drill points, so they can be driven into frozen ground, and the Manila ropes have a tensile strength of 1,000 pounds. Sketch on top illustrates how the equipment, which is distributed by Air Associates, Inc., of Teterboro, N. J., is used in mooring a small airplane.



Ten-Mile Aerial Eye. A sharper eye is provided for Air Force reconnaissance by the new lens shown here without its covering. Nearly four feet long and 15 inches in diameter, the huge telephoto eye has five glass elements, a focal length of 60 inches, and a speed of f/6. The coils surrounding it are an electric heating device that keeps the lens in proper focus at high altitudes up to 10 miles by preventing low temperatures from shrinking metal of the mount and camera. It is made by Eastman Kodak.

What's New in Aviation



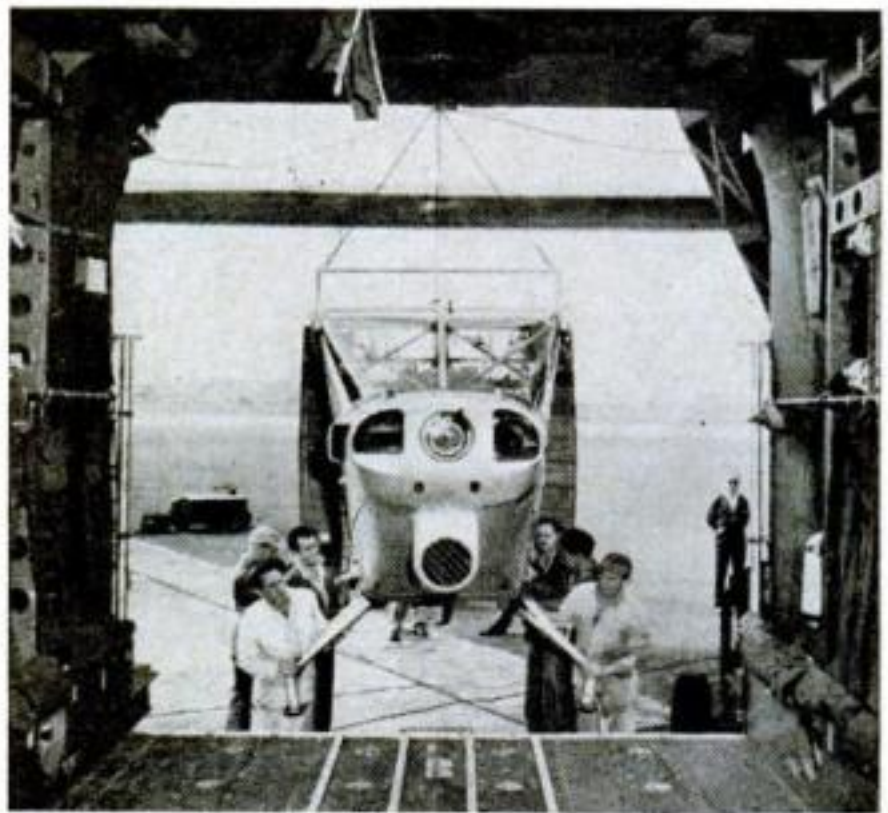
Balloon Powers Wind Tunnel.

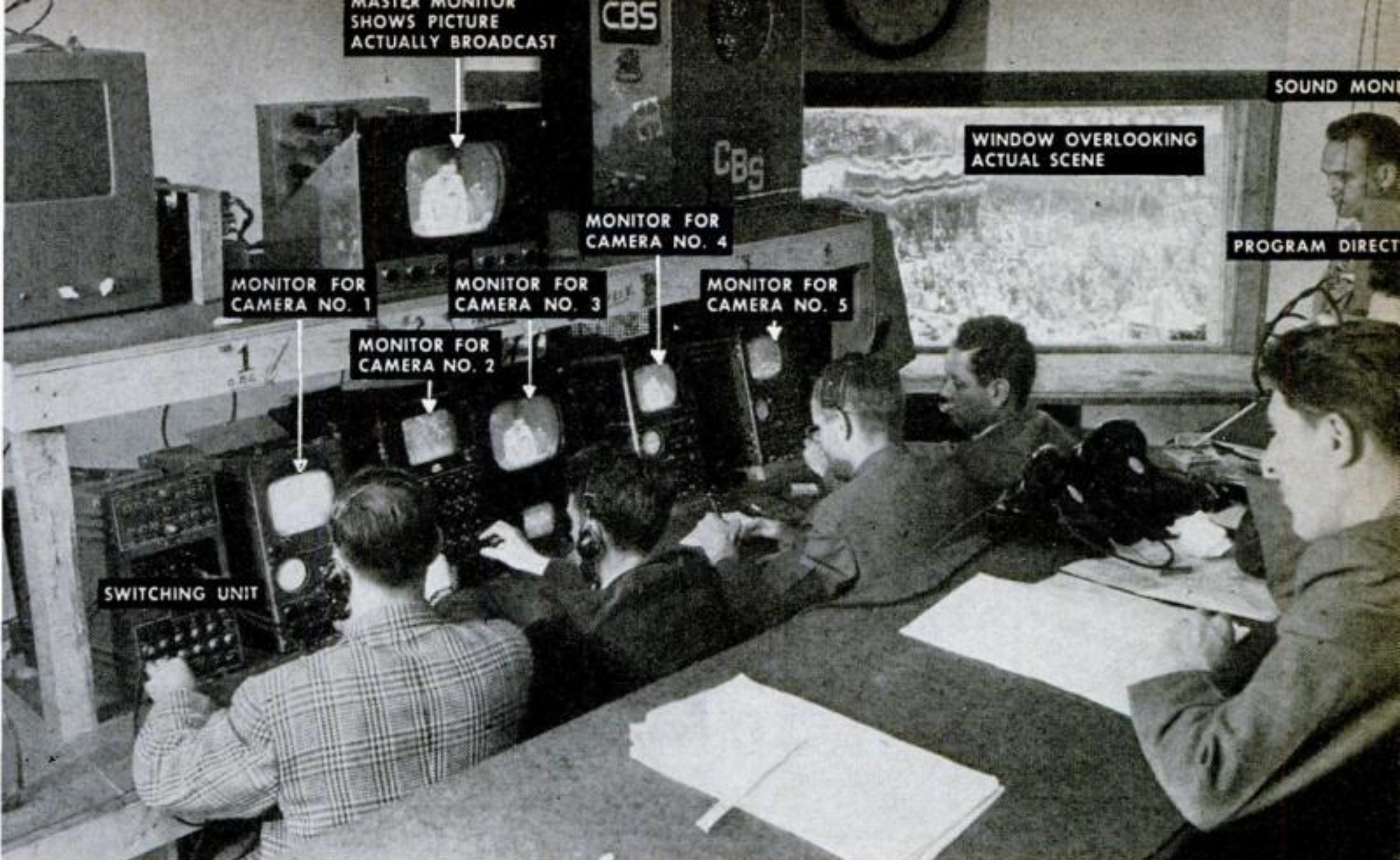
Wind velocities up to 3,400 m.p.h. are created by a new balloon-vacuum sphere combination built by North American Aviation. It will be used for testing rocket and plane models at supersonic speeds. A cup-shaped, rubber-impregnated nylon balloon, 34 feet in diameter and 20 feet tall, is housed in the steel chamber at far right in the above sketch. This balloon is filled with

air that has been dried by being pumped through a battery of silica-gel beds. In the meantime, the air has been pumped out of the sphere, top center, to create a 99.5-percent vacuum. When released, air rushes from the balloon to the sphere at a rate of 65,000 cu. ft. a minute through a 16- by 16-in. test section holding a model. The blast lasts 16 to 21 seconds. The tunnel is patterned after one used by the Germans.

L-13 Gets Air Lift, Road Test.

The folding wings and tail surfaces make it easy to load the newest version of the Air Force's aerial Jack-of-all-trades, the Convair L-13, into a C-82 Packet flying boxcar. In photo at right, mechanics, with the aid of an overhead crane, swing the L-13's nose into the cargo compartment and shove it forward on roller-type skids attached to landing-gear struts. The L-13 also boasts a shimmy-free tail, thanks to a pilot-controlled locking device. Photo below shows this under test as an aft fuselage section is towed over rough California roads. After 724 miles, equal to 1,400 take-offs and landings, the redesigned assembly was still in excellent condition.





From screens showing view of each camera, program director (right) picks shot you see.

How Television Covers the News

Teamwork by telephone brings you the best of many words and pictures available at any moment.

By John F. Loosbrock

LINE up half a dozen television sets in your parlor. Tune five of them to five different broadcasting stations. Clamp an earphone over one ear and, by plugging in and out, try to hear as well as see what each of the five stations is transmitting. Then try to keep your sixth receiving set tuned to the station that is broadcasting the finest picture and sounds, minute by minute.

You can do all this, of course, with one hand and one ear. With the other hand and ear make six telephone calls at once to six different people. Meantime, answer the wigwagged questions of a friend outside the window by nodding or shaking your head.

Remember to glance at the clock at least once every 30 seconds, because timing is important. And all the while, nonchalantly smoke a cigarette so that you will appear calm and collected whenever the boss sticks his head in the door.

That will give you some idea of a television program director's job. He is the quarterback of a new kind of team—a team of engineers, journalists, and showmen. To produce a good television show, this team must work as smoothly, swiftly, and surely as the Four Horsemen of Notre Dame.

Each video network now has several such teams. The best of them were assigned to the national political conventions in Philadelphia this summer, so I went backstage to see them in action there. The television pictures you will see in the future, of sports events, political rallies, military maneuvers, and so on, will be brought to you by the

same experts in the same complicated ways.

While you were seeing one picture in your home, some of these electronic engineers were juggling a dozen pictures, being taken simultaneously by as many different camera crews in different locations. You saw only the one picture that a series of editors, by flicking switches, had decided was the best.

Suppose, for a minute, that all four cameras in Convention Hall are focused on a delegate making a nominating speech. The picture from each of those cameras goes first to a monitor in a semidarkened room. By watching the wavy green lines on an oscilloscope directly beneath his viewer, the monitor checks on the light distribution in the picture. By twisting dials he can improve it, the way a darkroom worker improves on a still photographer's work.

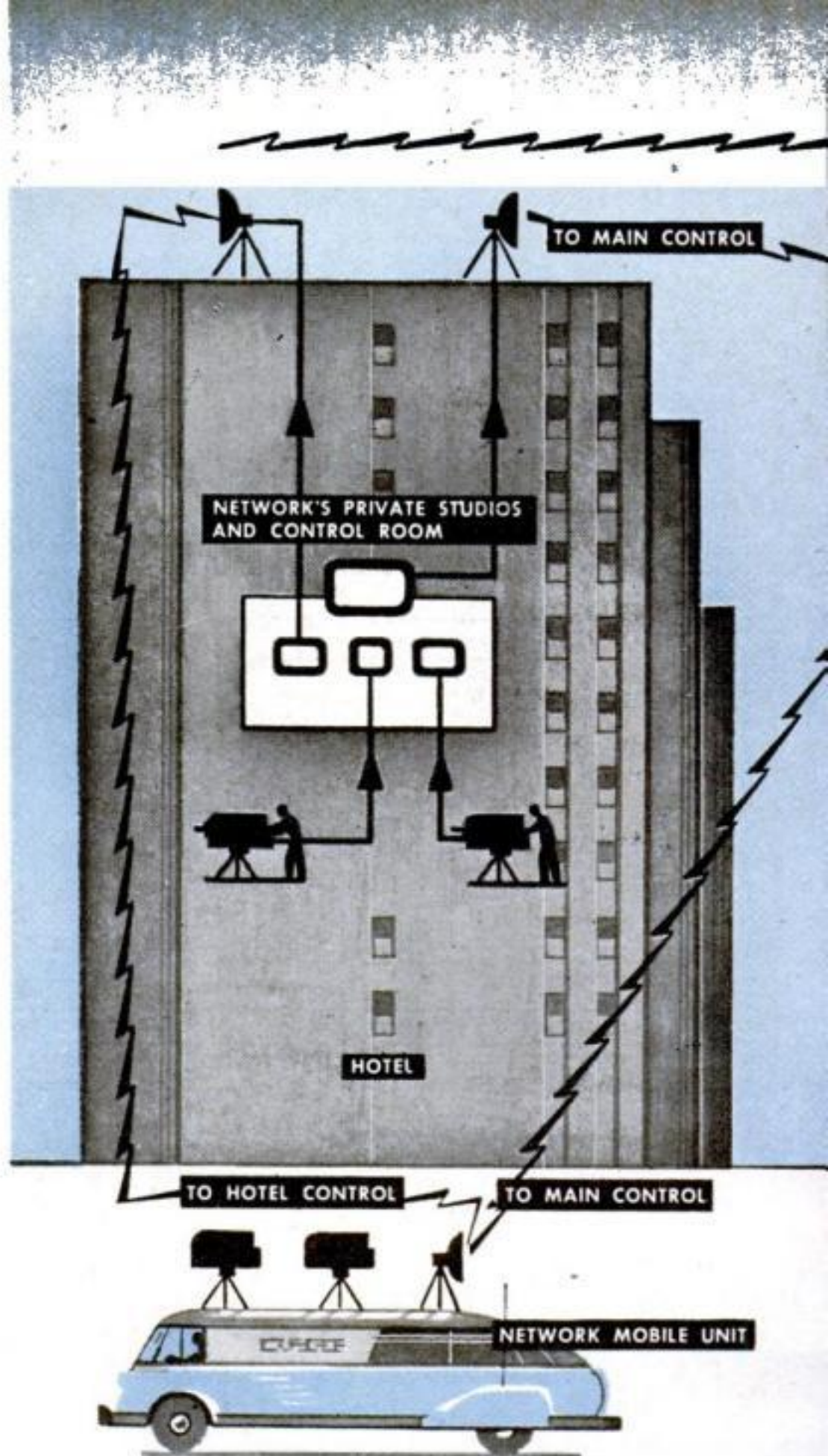
Program Director Calls the Turn

Behind the four monitors "handling" these four pictures, a program director watches all four screens at once and selects the one he considers best by calling out the number of the camera producing that picture. This final selection is the picture that goes to each of the major networks, who pooled their resources to cover the convention floor.

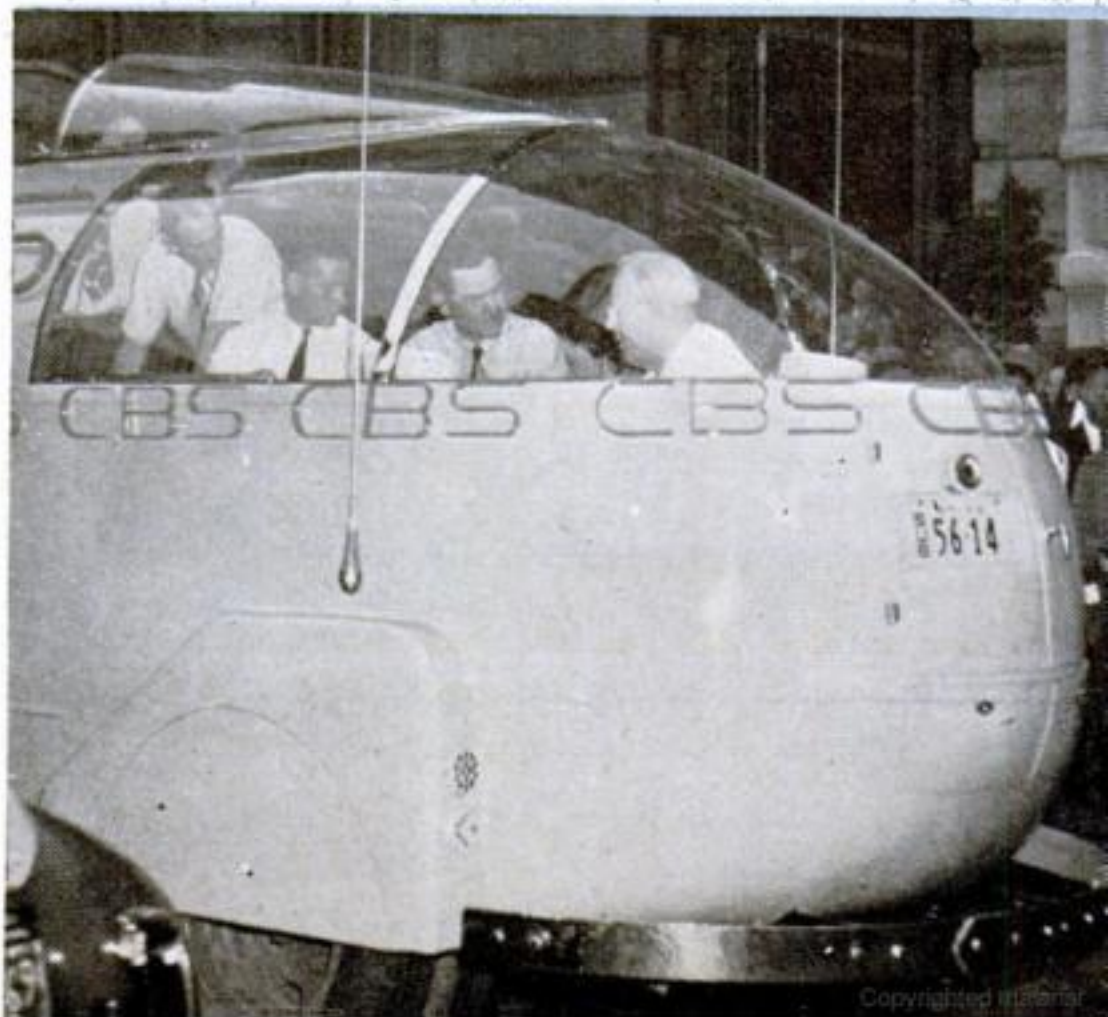
Now step into the NBC program director's room. In addition to the selected picture from inside the convention hall, he has many others from which to choose one for broadcasting. Three cameras have been grinding simultaneously from a downtown hotel room; one of the pictures from those three is passed on to the director, just as one comes to him from the four cameras in the convention hall. Three others have been operating in Washington, and one of those three pictures also is reaching him—plus two or three from mobile street units.

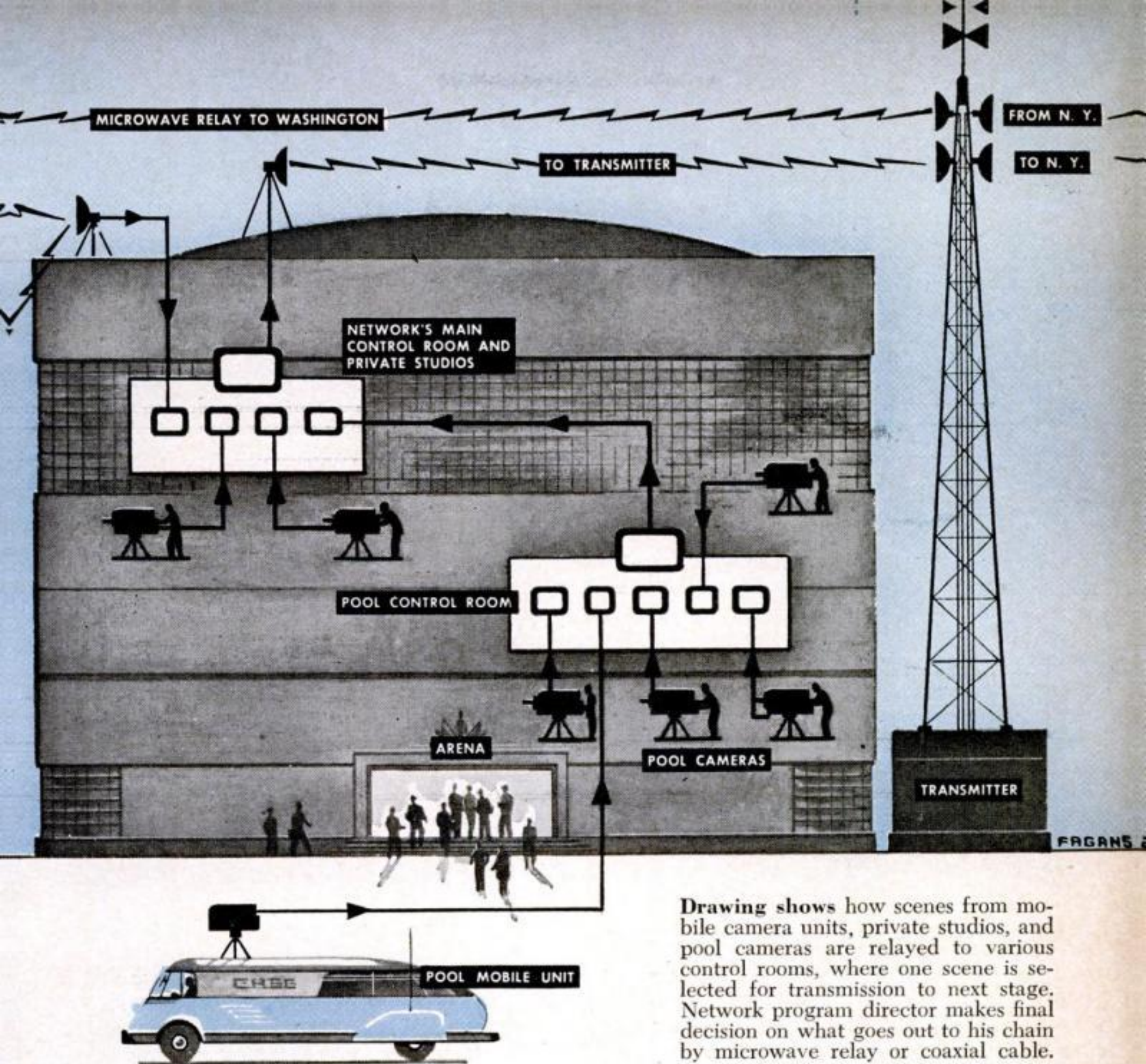
From all these pictures the director has to select the one that, in his opinion, makes NBC's coverage of the event most interesting to you. (By watching still more viewers he can see exactly what each competing network is transmitting, minute by minute.) In a split second he must make decisions for which a newspaper editor might have a couple of hours; a magazine editor, a week.

And then, after this one best picture has been selected out of the dozen or so that are available, it is transmitted to your local television station in one of two ways, or by a combination of both. It may be piped in over a coaxial cable, which now connects a network from New York to Richmond along



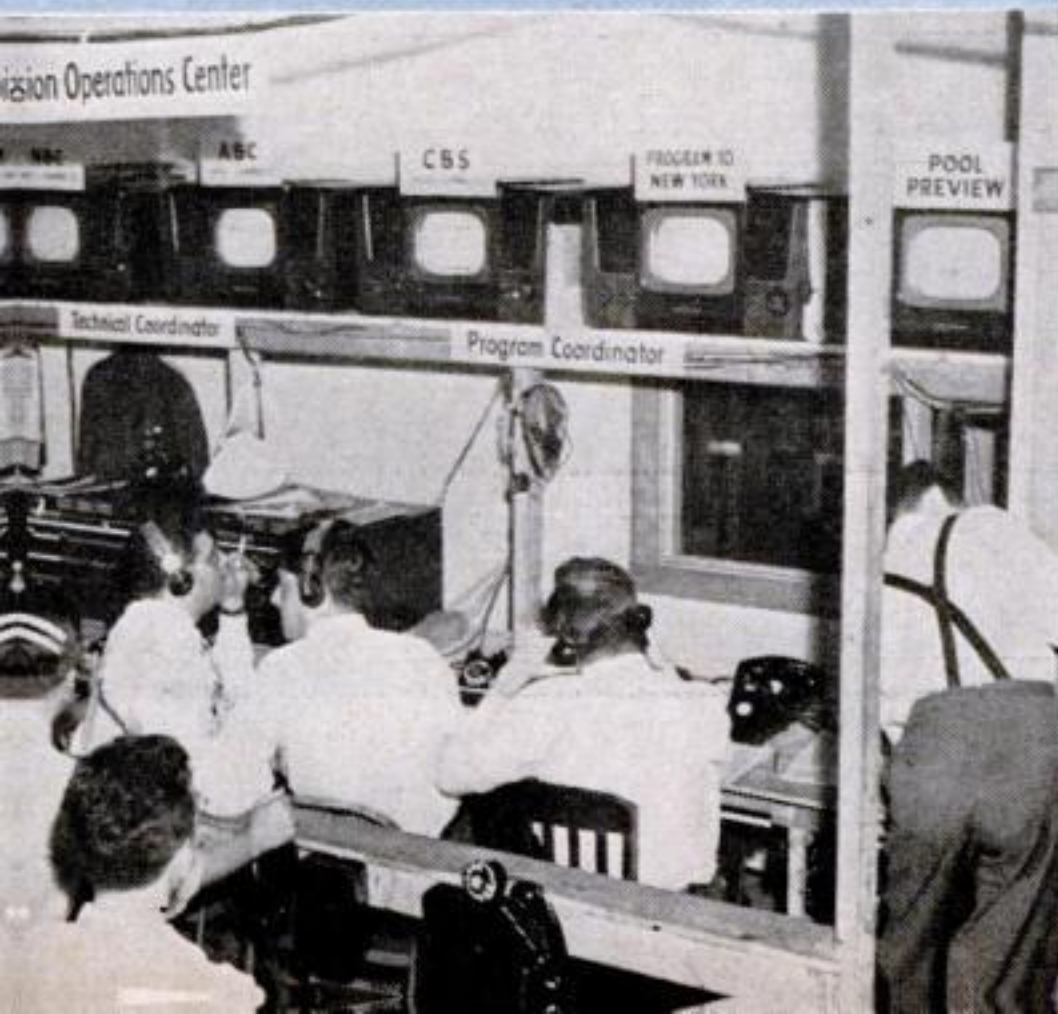
Studio on wheels used by Columbia Broadcasting has a plastic bubble for wide view.





Drawing shows how scenes from mobile camera units, private studios, and pool cameras are relayed to various control rooms, where one scene is selected for transmission to next stage. Network program director makes final decision on what goes out to his chain by microwave relay or coaxial cable.

At big events, such as conventions, NBC coordinates its crews from operations center.



TV camera with telescopic lens covers stage while another picks up "color" in audience.





Makeshift control rooms—like this one set up in a hotel linen closet—direct shows staged in temporary studios. Programs were relayed on microwaves from here to main control center.



Scenes shot from the mobile units are relayed over microwaves to control room. This dish antenna fed the hotel studios, but a similar one linked mobile units to main control room.

the Atlantic Seaboard; or it may be beamed through the air over microwave transmitters. Then your local station sprays it out over its 40-mile-plus radius. Your antenna picks it up, and you see and hear a President being nominated—from your own armchair.

All this shows you that putting a television show on the air isn't just a question of plugging a camera into the nearest light socket and pointing it at a subject. It's a complex blending of sight and sound that combines all the headaches of radio, the movies, and news editing—plus a few that are peculiarly its own.

Among these television headaches is the complexity and relative immobility of equipment. Another is the size of the crew it takes to handle it and the skill they need.

Again, suppose you are in charge of televising a show from Constitution Hall in Washington, as NBC did recently. In radio, two men could handle the whole business—one engineer to set up the mikes and cables, plus the announcer, who could give a hand with the mikes if necessary. But for your television show, you have to scout around for a place to run the $\frac{3}{4}$ -inch cables that supply the power for the cameras and pipe the image out of the hall. Your crew must spend three or four days snaking the cables through ventilation ducts. You need at least two cameramen, an audio man, a technical director, a video control engineer, plus a couple of men on the lights and to help out in general. All these, plus a program director and an announcer, to telecast the same show that two men could handle for radio. No wonder television costs money.

And your crew can't throw that equip-

ment into the back seat of a car and take off at a moment's notice. It's heavy! Two cameras are considered an almost irreducible minimum for any kind of a show; so that means 560 pounds just for the cameras and their auxiliary equipment. Add a master monitor (68 lb.), a switching unit (72 lb.), another power supply unit (57 lb.), 300 lb. of cable, 200 lb. of test gear, and 50 lb. of audio equipment—and you'll find that it will fill a three-quarter-ton truck.

Right now, television people are pretty much limited to covering events where there is some nearby commercial power source that can be tapped into. But there's no reason why a 10-kilowatt generator couldn't be installed in a mobile unit and supply enough power for the average outdoor show. Studio power requirements are higher; the big lamps pull around 400 amps through the cables. But a field job with lights can be run with as few as 100 amperes; without lights, such as at a football game, 30 to 40 amps will keep the cameras rolling.

That brings up a point the television people are touchy about. Most stories of the Philadelphia conventions blamed television for the giant lights that turned the hall into a Turkish bath. But the big lights were for the newsreels' benefit: an NBC engineer said he got his best pictures at the close of each session, after they had been turned off.

TV cameras are pretty tricky to operate and need a lot of servicing. Tubes in particular, because of the wide band of television frequencies, take quite a beating and must be replaced frequently. That's why at least one of the big networks, NBC, uses engi-

neers rather than program men as cameramen. They feel that it's important to have a trained technician on the spot, to service the camera in case of trouble, even though he may not have quite as keen a sense of dramatic values as the program man.

You'll run into other technical mishaps from time to time, always disconcerting, sometimes amusing. One rare complication occurred during the first "Three-City Round Table" discussion program, which NBC staged during the Democratic convention. Three programs were being televised simultaneously from eight cameras in New York, Washington, and Philadelphia.

The program director for this particular show was in New York, watching three screens, one from each city. A cameraman in Room 22, the NBC studio in Convention Hall, absent-mindedly focused on a receiver in the studio that was tuned into WPTZ, NBC's Philadelphia outlet. The Washington show was on the air.

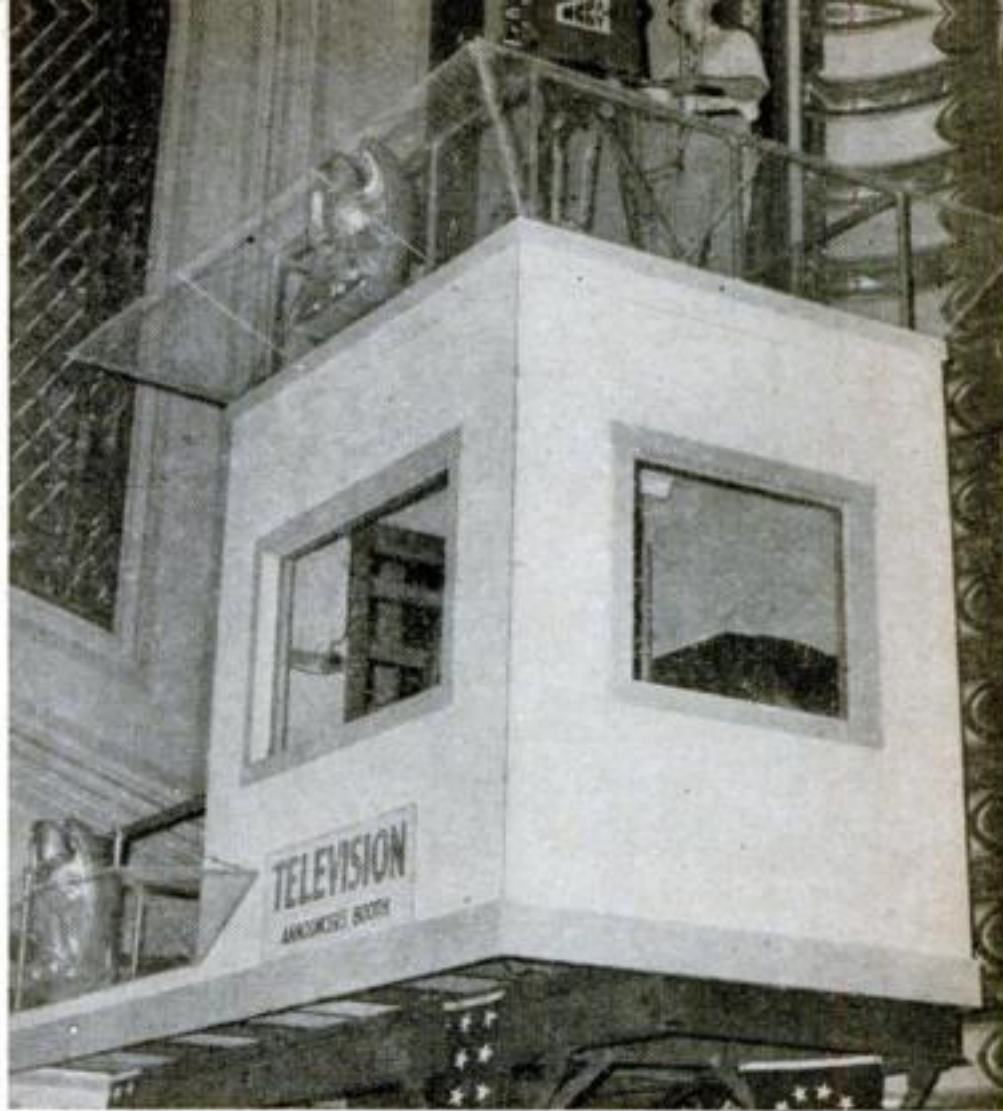
The director in New York looked at his Philadelphia screen, saw a shot of a TV receiver tuned to the Washington show. He thought this added a little dramatic interest to the show so he called for the Philadelphia picture to go on the air.

But he forgot that when he cut the Washington picture off, the Philadelphia camera would be shooting at a blank screen. The image from the Philadelphia camera went up to New York and back over the network to WPTZ. The receiver in the studio now showed an image of a receiver with a blank screen. The ring-around-the-rosy went on, with the receiver showing a series of images of a blank screen, each succeeding one smaller than—and inside—the preceding one.

Image in an Image in an Image

Actually, this video feed-back lasted only a moment, and most watchers probably got the sensation of seeing a blank screen for only a few seconds. But engineers knew what had happened, for they play around with feed-backs for their own amusement. In some cases, they say, they have been able to count as many as 34 distinct images, one inside the other.

Another odd and typically televistic foul-up occurred during a show from the hall before the Democratic convention. It was an exclusive NBC show, so they couldn't use the cameras in the hall that were reserved for the pool coverage. A mobile unit from WPTZ set up one camera outside the



Soundproof booth was built for commentator who described pool telecasts at political conventions. Atop booth is camera No. 4, which covered rostrum from right side of auditorium.

hall, one inside. The script called for commentator Bill Stanton to drive up in a taxi. Then he was to engage the cab driver in conversation, asking him if he had seen the Republican convention. The cabbie's answer being "No," Stanton then was to walk into the hall with him, describing the tumult and the shouting that the Republicans had put on a few weeks before.

With only two cameras, there was a tough transition problem to lick, to fill the gap from the time Stanton and the cabbie moved out of range of the outside camera until the inside camera could pick them up. To plug the gap, New York was to cut in with some movies of a Republican demonstration, as background for Stanton's conversation with the cabbie.

But the portable "beer mug" voice transmitter that Stanton carried went dead. (Actually, as engineers discovered later, the switch had been accidentally turned off.) Television sets then were getting sight but no sound. So the director in New York hastily cut in the movies of the Republican convention and frantically switched the sound to commentator Ben Grauer, inside the hall, and asked him to ad lib to fill in the hole. But Grauer didn't know that the New York movies were filling the television screens with shots of the shouting, sweating Republicans at their most boisterous. He



Randolph Churchill, son of Britain's wartime leader, is made up for television appearance.



This is how Mr. Churchill looked on the viewing screen. Makeup eliminates bad shadows.

solemnly began to describe the vast, echoing reaches of the empty hall at the moment, the activities of the janitors, the guards, and the charwomen.

But despite such headaches, television is gradually licking its problems. Equipment will become more mobile; and as mobility increases, flexibility of coverage will follow. Eventually, video engineers hope to cover regularly such spot news events as fires, explosions, auto accidents. Also to come are telecasts from planes—NBC put on a show recently from a Navy aircraft carrier.

Engineers are looking for better and cheaper methods of transmission than the costly coaxial cable and microwave systems. Eventually, perhaps, TV can plug into telephone lines, the way radio does today.

But, actually, the burden of proof in television rests not on the technicians, but on the program planners. In fact, a more-than-casual onlooker gets the impression that the

technicians are running the show. TV people get furious at the comparison, but the situation is much like the early days of the movies—but with a big difference. Audiences then were so amazed at seeing pictures that walked and later talked that they weren't too concerned with the artistic quality of the offerings. Audiences today are more critical: they've seen pictures walk and talk for years. And the public doesn't appreciate or even care about the technical difficulties involved. It wants a good show, and a program isn't good just because it involves some technical pyrotechnics.

But if television still has to catch up with radio and the movies on smooth production of dramatic shows, it is already leaping ahead of the competition on coverage of spot news. When the Russian schoolteacher jumped out of a window in New York, TV pictures were in front of the public well ahead of newsreel and newspaper shots. **END**

What Telecasters Mean When They Say

Go to slide—show station insignia.

Clean up the ghost—remove a second image that is accompanying the principal one.

Clean it up—improve focus of the picture.

Hot it up—warm up camera tubes to go on air.

Strike the camera—dismantle camera to move.

Roll 'em—give the cue to performers to begin talking and acting.

Big dish—microwave antenna used for network transmitting and receiving.

Bloom—an overexposed or lightstruck image.

Freeze—used to indicate that set designs and arrangements, or positions of furnishings, dressings, etc., or other production facilities, are approved for televising.

Nemo—a broadcast originating in some other location than the television studio.

Rain—vertical interference patterns that appear on the receiver's viewing screen.

Snow—spotty interference on viewing screen.

Hot Wind Dries Grain

FARMERS sometimes have to make hay—or grain, at least—even when the sun isn't shining. Yet wet grain soon spoils through germination, and may even start fires in storage bins and boxcars. Now it can be quickly dried without the cumbersome installations formerly required.

In this new mobile drying machine, the grain goes in one end wet, travels less than 25 feet on a conveyor, then emerges at the other dry, cool, and ready for storage.

The wet grain enters through a hopper where an adjustable gate spreads it evenly over an 8-foot-wide, wire-mesh conveyor. Moving slowly, it passes first through a drying chamber where a blower draws hot air up through the grain to carry off its moisture. Raker-bar agitators insure even drying.

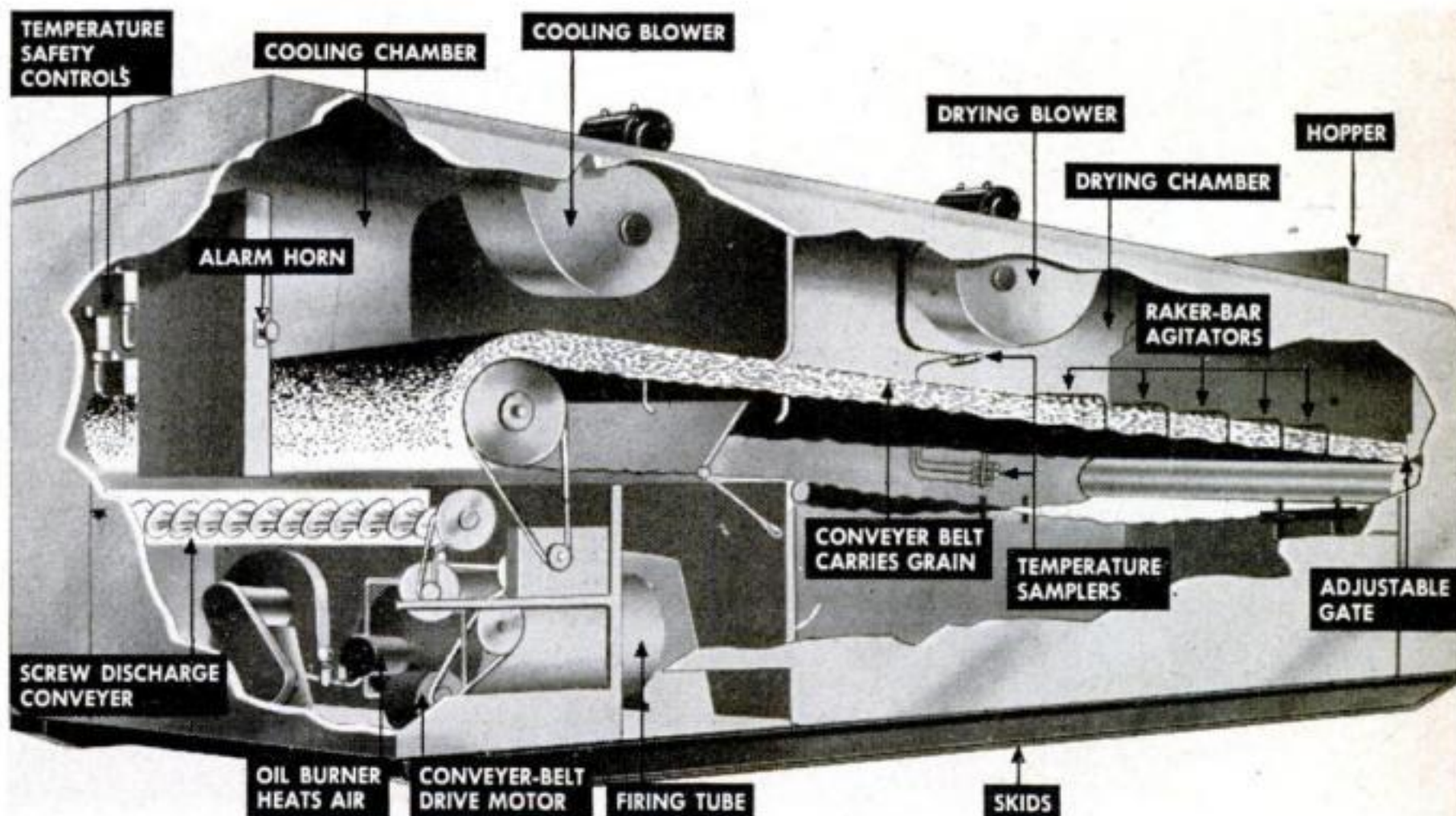
The grain then moves into a second chamber where another blower draws fresh air through it to cool it. At the end of the line, the grain drops into a screw conveyor that carries it off for storage.

Called Arid-Aire®, the new machine, diagrammed below, can handle up to 200 bushels of corn or 400 bushels of small grain an hour. Unlike existing vertical-column, gravity-feed driers, it eliminates raising the grain to the top of a high shaft. It also avoids injury to the grain through grinding



In single operation, wet grain can be fed into machine from elevator, dried, then stored.

and clogging in the shaft. Automatic temperature controls prevent scorching, while other controls sound a warning horn if any part of the machine fails. Mounted on skids, the drier can be easily moved from one storage elevator to another.



'Waldorf on Wheels'

By Devon Francis

Drawings by Ray Pioch

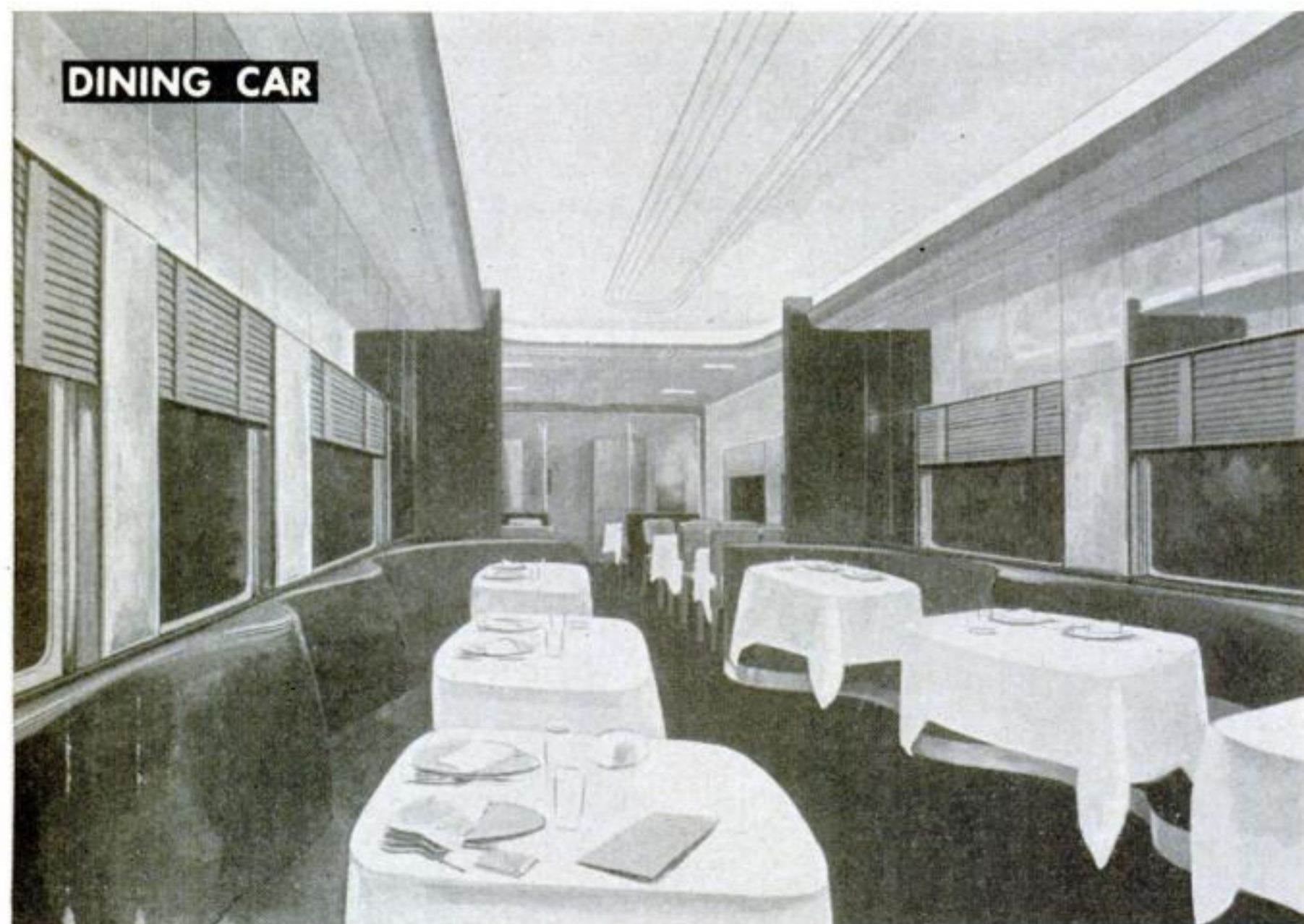
THE NEW YORK CENTRAL Railroad last month introduced to the traveling public its postwar bid for patronage between New York and Chicago. It's a super-doooper Twentieth Century Limited with running ice water in every room, pneumatically operated doors, fluorescent lighting, both inter-car and radio telephone, and private rooms for the crew.

The two new trains—one each way each day—set the railroad back a total of \$4,000,000. The 16 to 18 cars they normally carry



Diner of new Twentieth Century Limited seats 64 persons. Plan view shows arrangement of tables. At one end (opposite page) are lockers

and steward's desk; at the other (left above) is waiting lounge. Kitchen, which usually takes up nearly half of railroad diner, is



Legless tables in center section of diner are supported by cantilevers extending from seats. Panels between windows are mirrors. Venetian blinds are gray-brown; seats, gunmetal leather;

wing partitions, red leather. The train's three public-assembly cars—diner, club, lounge—cost \$130,000 each. All pictures shown here are renderings by the designer, Henry Dreyfuss.

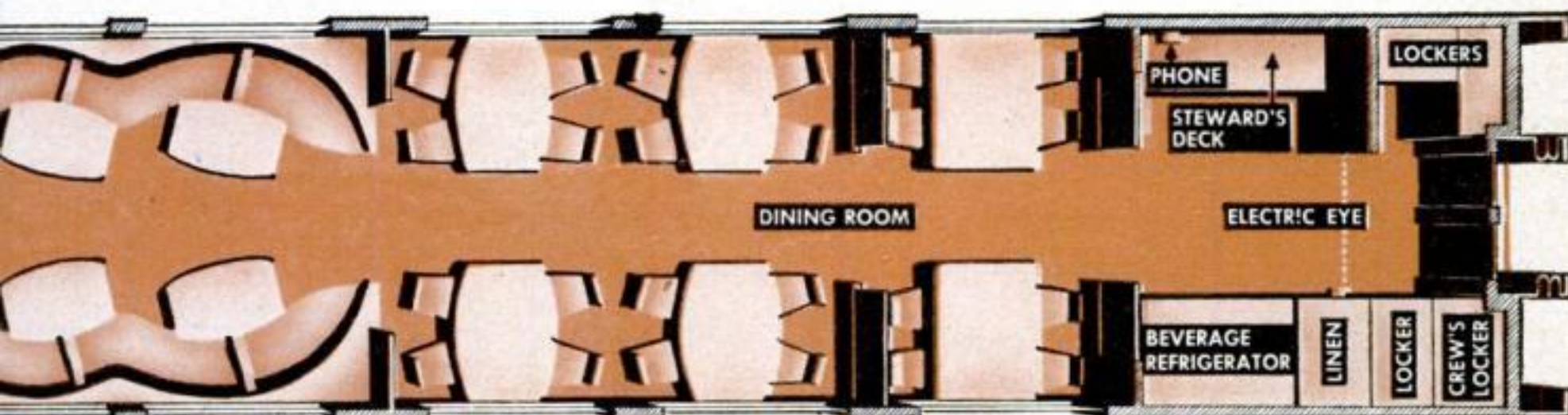
have exteriors of two-tone grays and interiors of reds, grays, blues, greens, and browns. Each is pulled by a double-unit 4,000-hp. Diesel-electric locomotive.

Wire-recorded music drifts through the lounge cars and cocktail bars. Every private bedroom has outlets for electric appliances. Each car has its own 20-kw., 80-volt motor generator. The whole train, of course, is air-conditioned.

In their bedrooms, the first passengers on the new Century found that they didn't have

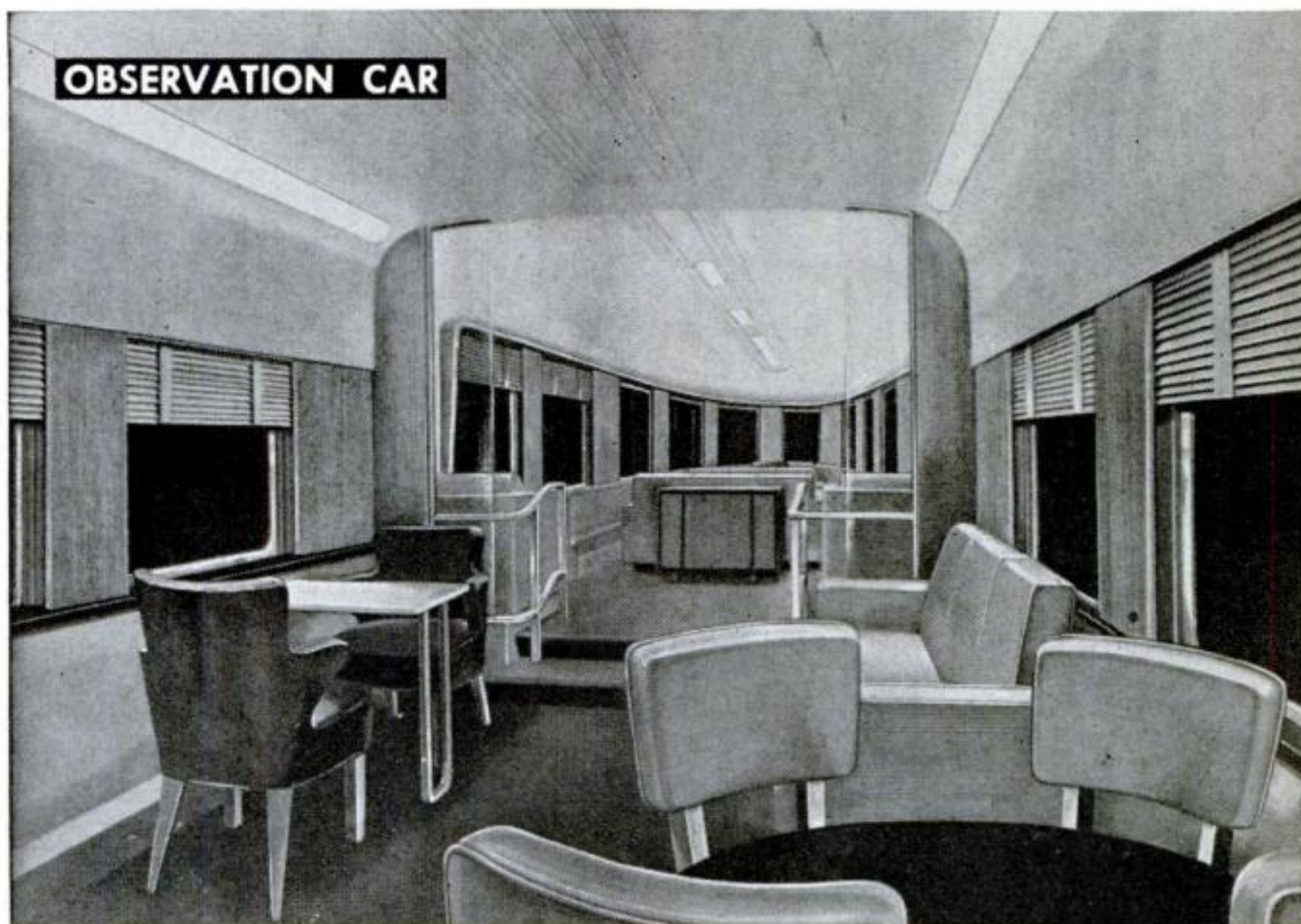
to pull and haul at the toilet to separate it from the wall and get it down to a horizontal position. That's done hydraulically at the push of a button.

Every car except the one that carries the mail has doors that open at the touch of a finger and close automatically. Air does it. The designers were going to put a pneumatic door in the passage between the diner and the kitchen-dormitory car too; but they got to wondering how the waiters could open it with trays in their hands. So they



in separate adjacent car. Car also houses dormitory for cooks and waiters, sleeping 15 in bunks arranged in tiers of three. Kitchen equip-

ment includes electric refrigerator and dishwasher. Fittings are of stainless steel. Extra-long trains will carry two diner-kitchen units.



Lookout Lounge has windows 10 in. higher than usual. In foreground is cocktail lounge, seating 9 persons; at far end, observation lounge with seats for 14. Forward part of car has 5

double bedrooms and bar for serving snacks and drinks. Dominant colors are brown and green. Portable phone in observation section connects with local telephone system at scheduled stops.

settled for a door opened by a photoelectric cell.

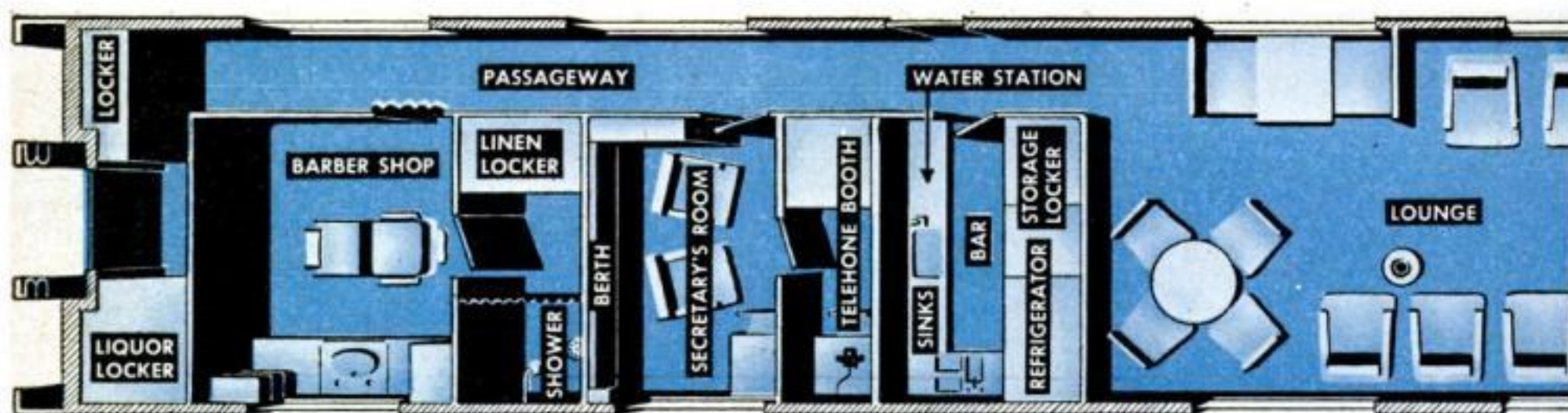
That separate car for the kitchen is another innovation. It not only leaves a lot more space in the diner for eating, but provides rooms for berths to which the cooks and waiters can retire when the day's work is done. Porters have separate rooms in the passenger sleeping cars and in the club and observation cars.

Phone service in the old Century was only between the cars and the diner. Now a passenger can ask the porter in his car to dial any other car and have his man paged. If the porter has trouble locating a passenger to answer a call, he can use a public-

address system with speakers in each of the public-assembly cars.

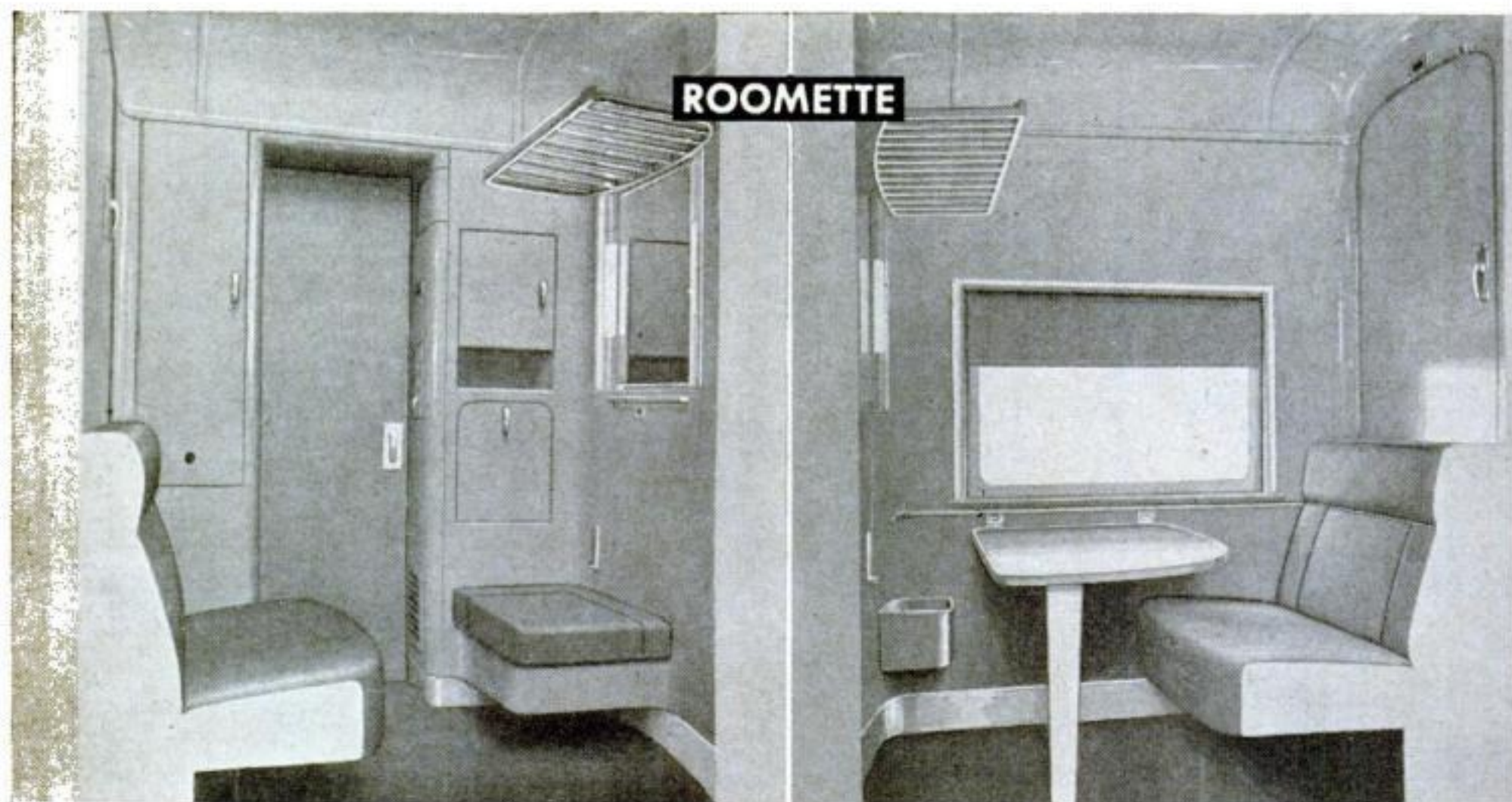
All cars ahead of the diner, except the club car, are on one party line; all those behind the diner, except the observation car, are on another; and the diner, club car, and observation car can be dialed individually. All the lines are interconnected, so that any car can be called from any other.

For the present, the radio telephone (already used on some trains of the Pennsylvania Railroad and the Baltimore & Ohio between New York and Washington) will be in use for passengers on the New York Central only between New York and Buffalo. The Bell System isn't quite ready yet to



Club car on the New York Central's new luxury train seats 30 persons. This plan view shows layout of its barbershop and adjoining shower

room, public-secretary's office, radio-telephone booth, service bar, lounge, public washroom, and porter's quarters. Barbershop, equipped with



Two views show roomette from window side and corridor (right). Without cutting size of individual rooms, Pullman has rearranged floor plan of car to get in 22 roomettes instead of

the former 17 or 18. For first time on New York Central, wash basin is on corridor side, over toilet seat. This permits wider window. Table comes out, and berth pulls down from wall.

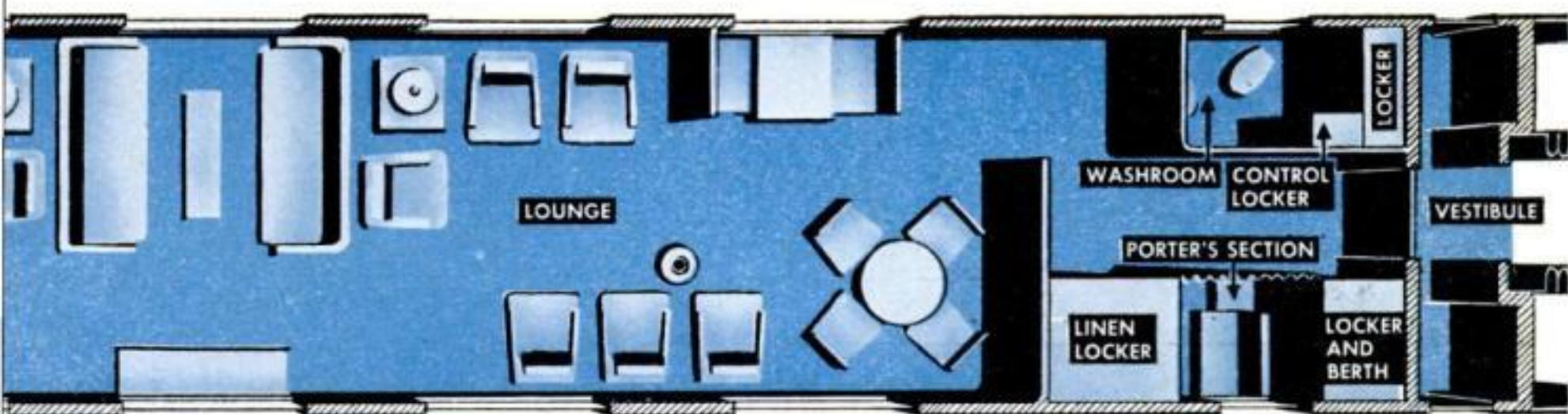
expand the service to the Buffalo-Chicago segment of the run. But from east of there a passenger can telephone to anywhere in the United States. When the Century's hookup is complete, it will be the nation's longest stretch of train radio operation. Meantime, you can phone over long-distance lines from the train at station stops.

The new train has added comforts as well as convenience. Improved coupling of the cars eliminates practically all the play. Starts are as smooth as silk, and sudden application of brakes doesn't bring that familiar jar. The brakes themselves have been redesigned, too, so that governors correlate the speed of the train and the

amount of power for braking. Moreover, if a wheel tends to slide during braking, the pressure automatically is released to prevent it. That makes for smoother stops and saves flattening wheels.

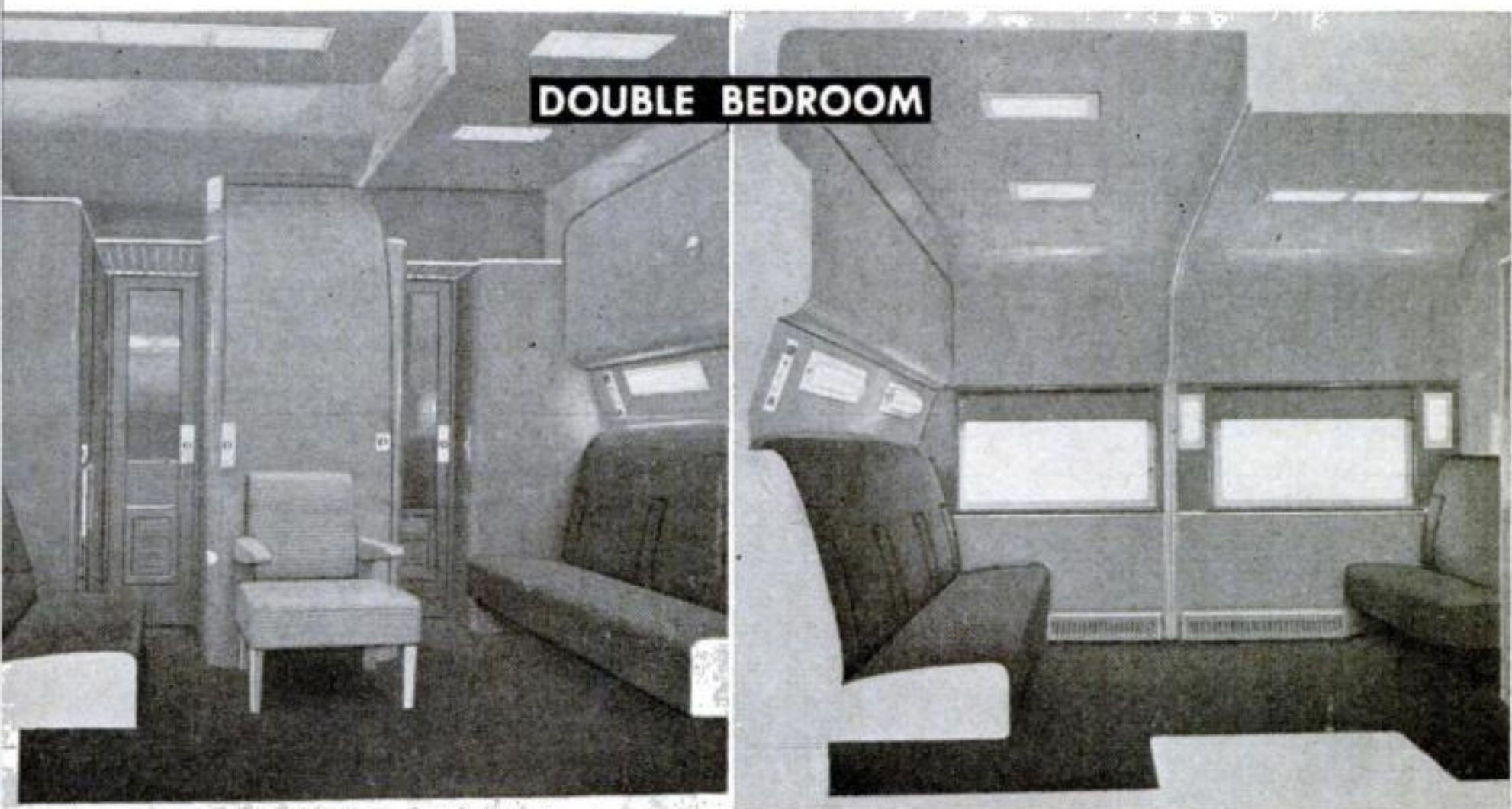
The new Century has two different arrangements of passenger cars: one with 22 roomettes and one with 10 roomettes and six double bedrooms. Another with 12 double bedrooms will become available later this year. The railroad has ordered 97 of these various types of cars and will use them also on some of its other trains. Thus you won't necessarily have to ride the extra-fare Century to enjoy some of the luxuries shown below.

END



folding pressing board, offers valet service; secretary's office has electrical outlet for dictating machines. Car's color scheme is mainly browns

and greens. Lounge tables have steel frames and black plastic tops. The new cars, manufactured by Pullman Standard, were ordered in 1944.



Window and corridor views show spaciousness of double bedroom. Besides the usual seat and sofa, each has a movable, folding armchair. Beds—an upper and a lower—are arranged trans-

versely and longitudinally to axis of car in alternate bedrooms. Toilet facilities are enclosed in separate room. Two adjoining bedrooms can be opened up to make large connecting suite.



Outboard Has Neutral

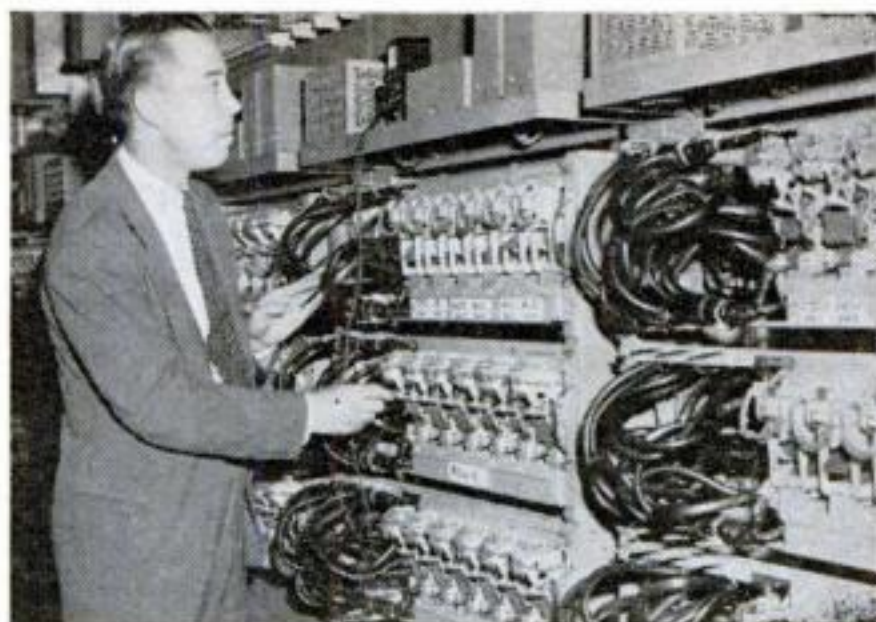
THE outboard motor above is running full tilt—notice the discharge from the pump—but the propeller isn't turning over. The answer is in the button just above the operator's right hand—the control for a new neutral, forward, and reverse gear system that has been added to the Scott-Atwater outboard. At right, with the motor in reverse, the boat goes full astern with the tiller centered. According to Kattu Projects, of Forest Hills, N. Y., which developed the gear system, it weighs from one to five pounds, depending on the size of the outboard. It can be fitted to any standard motor and is said to add little to the cost.



It Leaps into Flight

WHEN the novel channel-wing plane at right was flight tested recently, the manufacturer claims that it leaped 15 feet into the air before the pilot realized he was airborne. Airspeed was only 30 m.p.h. Flown entirely by engine control, the craft has no ailerons, flaps, brakes, or wing area except for the channels. The latter are six feet in diameter and nestle engines driving pusher propellers. The plane was built by the National Aircraft Corp., formed to explore the theories of Willard R. Custer, inventor of the channel-wing craft.





Electric Brain Directs Telegrams to Destination

THE world's first automatic telegraph center now speeds messages from New England to all parts of the country. It relays telegrams the way a dial telephone exchange switches phone calls, picking up the incoming message and sending it out over the proper wire to its destination. It requires no human direction.

Formerly, telegrams were received and printed out at the relay center, then carried by messenger to an operator who retransmitted the telegram to its address.

The new \$2,000,000 robot installation takes up two floors in Boston's Western Union building. A crew of engineers worked a year to set up the equipment, which has 3,000 miles of wire and a million connections. It triples the capacity of the old center and gives faster, more accurate service.

The brain of the new system is a complex



network of switches and wiring (shown in photos above) that "reads" identifying call letters in the address of a message. It picks out a line to the destination indicated by those call letters and switches the message to that line.

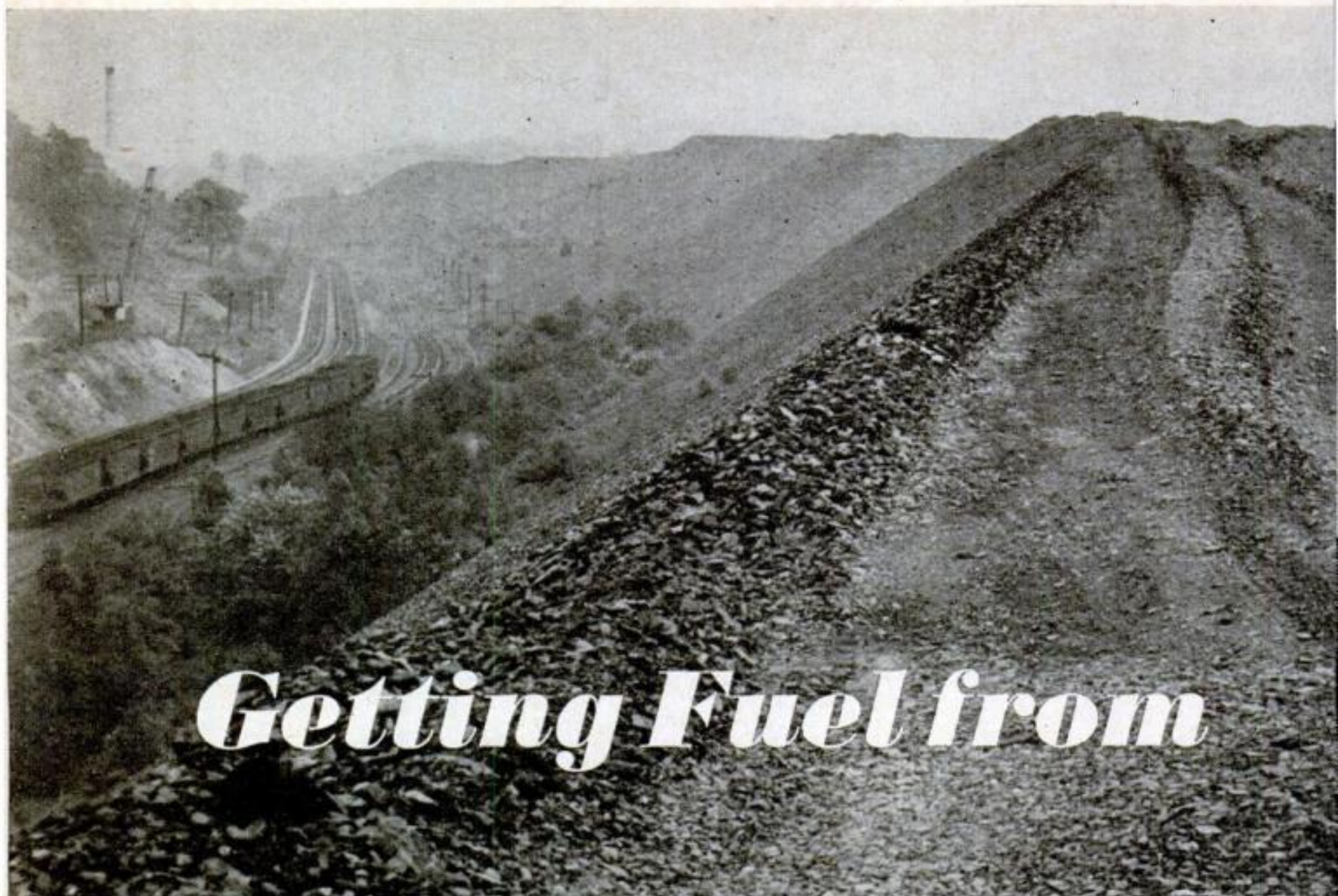
If, for example, a telegram is to be sent from Portland, Maine, to San Francisco, the Portland operator includes the San Francisco call letters in the message he types out on his teletypewriter, which is connected directly to the Boston center. Those call letters switch the message into a direct line to San Francisco.



Truck Sends Messages

THE Army's latest communications center can keep up with the fastest-moving troops. Radio equipment permanently mounted in

a truck (above) simultaneously sends and receives telephone and teletype messages over 1,000-mile distances. A generator in the trailer supplies power for the unit, which was developed by the Signal Corps.



Getting Fuel from

This typical Pennsylvania silt bank is more than a mile long and a quarter of a mile wide.

The mountains of anthracite silt that litter the Pennsylvania countryside may help to heat fuel-hungry America.

By George H. Waltz, Jr.

PS photos by W. W. Morris

MILE after mile, as you drive through north central Pennsylvania, stretches a man-made mountain range. Its high plateaus are splashed with acres of black, caked dust and inky lakes of sludge.

These are the anthracite silt banks—200,000,000 tons of accumulated waste coal. For years they have been piling up at the rate of 5,000,000 tons a year around the pit heads of America's richest hard-coal fields. Today these piles of waste are *equal to four years' total anthracite production of the entire United States.*

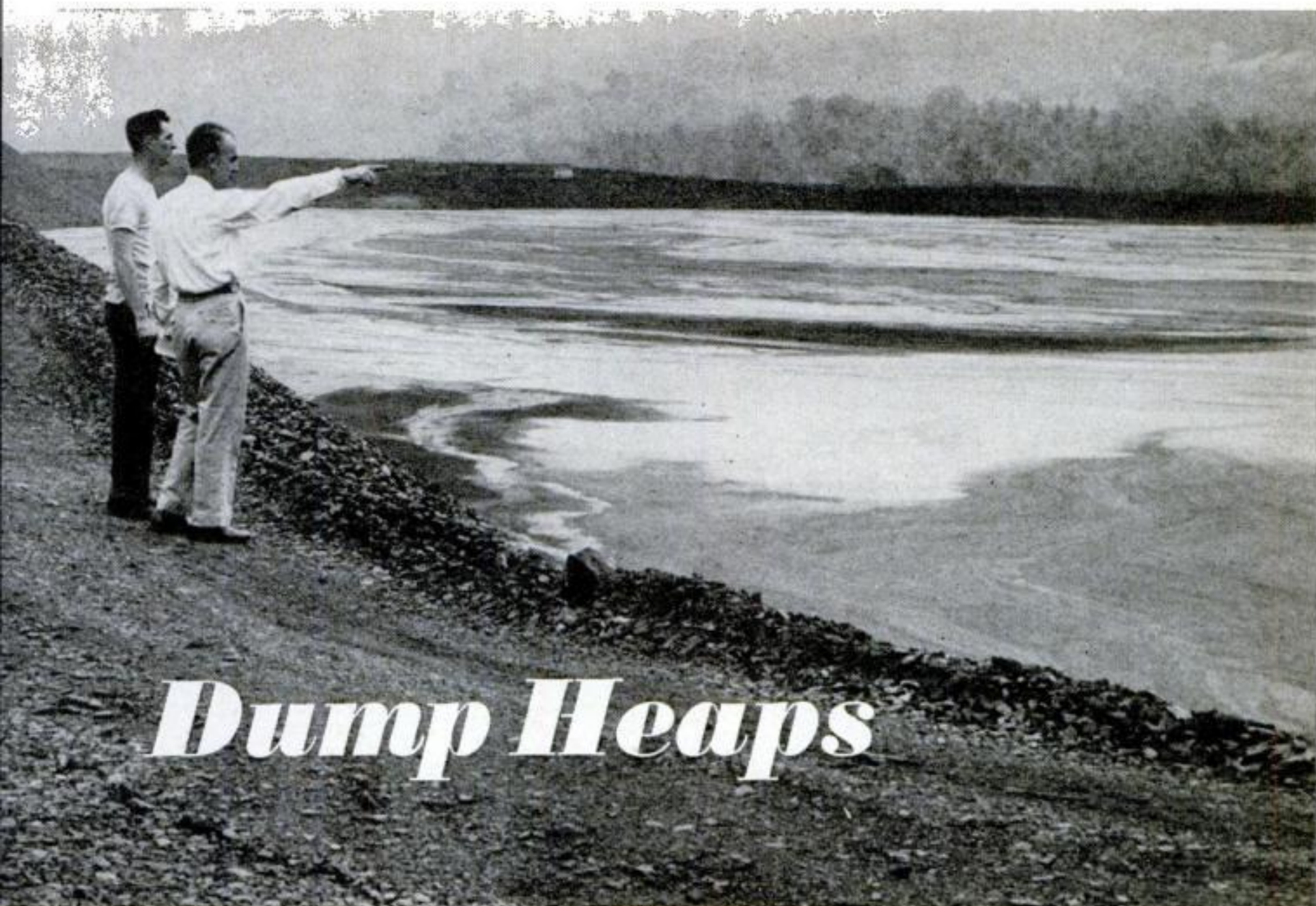
Washing and grading 10 tons of anthracite for market leaves a ton of silt. This mixture of fine coal particles and powdered slate and rock has been one of the mine-owners' major headaches. Besides the economic waste in these days of fuel shortages,

there was the problem of what to do with it.

Some operators simply dump it back into the empty shafts of worked-out mines. Others arrange mountains of waste rock and slate to form reservoirs into which the silt is pumped and left to dry. Many of these silt banks stretch for more than a mile in length. They sprawl half a mile wide. They contain as much as 9,000,000 tons. Worse still, smaller mines dumped the silt in streams—and polluted them for miles. Now anti-pollution campaigns loom large.

But the hard-coal people think they have the answer to the whole problem—waste, dumping, pollution—all at once. It sounds absurdly simple: They're going to burn the silt. But behind that answer is a lot of hard work—and good research.

On the average, silt is 75 percent coal and about 25 percent ash. Burning tests reveal that a pound of silt can produce in the neighborhood of 10,000 BTUs of heat as against 13,000 from a pound of coal. The hitch is that silt, as it is scooped from the silt banks, will not burn efficiently in ordinary furnaces.



Dump Heaps

Rock-walled reservoir holds millions of tons of anthracite silt washed from coal at mine.

How to get out those 10,000 BTUs efficiently was the problem set before the experts of the Anthracite Institute Laboratory at Wilkes-Barre, Pa., in the heart of the nation's hard-coal fields. Now after two years of intensive experimental work, the technicians have come up with two practical methods—each in the full-scale pilot-plant stage—for making the silt burnable. One plant turns it into fuel gas. The other squeezes the silt into finger-size pellets that can be shoveled into home furnaces, or poured into industrial furnaces fitted with traveling grates.

The silt pellets can be made in various sizes like macaroni to meet different furnace needs. The laboratory pilot plant is now turning them out at the rate of 200 pounds an hour, and a larger plant is under construction. Only 12 feet high and 30 feet long, it will be able to produce five tons of silt pellets an hour.

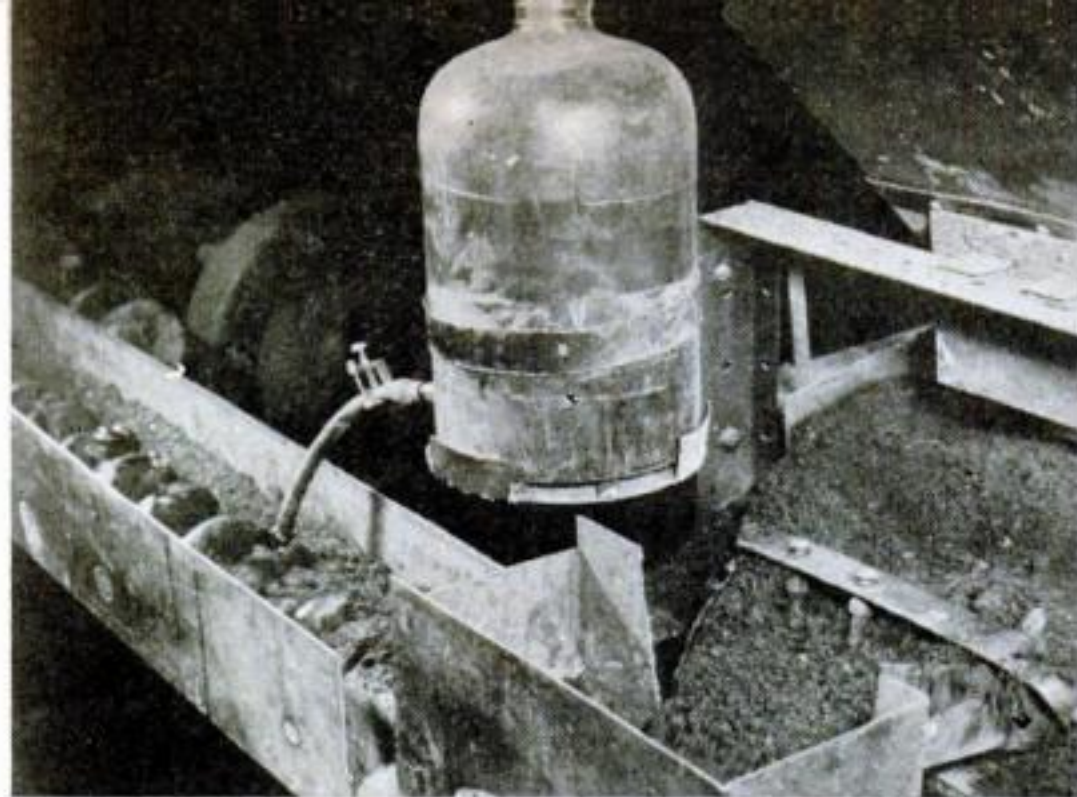
The silt is first dumped into a hopper that feeds it to a pugmill. There mixing paddles, arranged like the spiral of a pulled-out screw thread, churn it and mix it with water. From the pugmill, the silt is fed into an extrusion



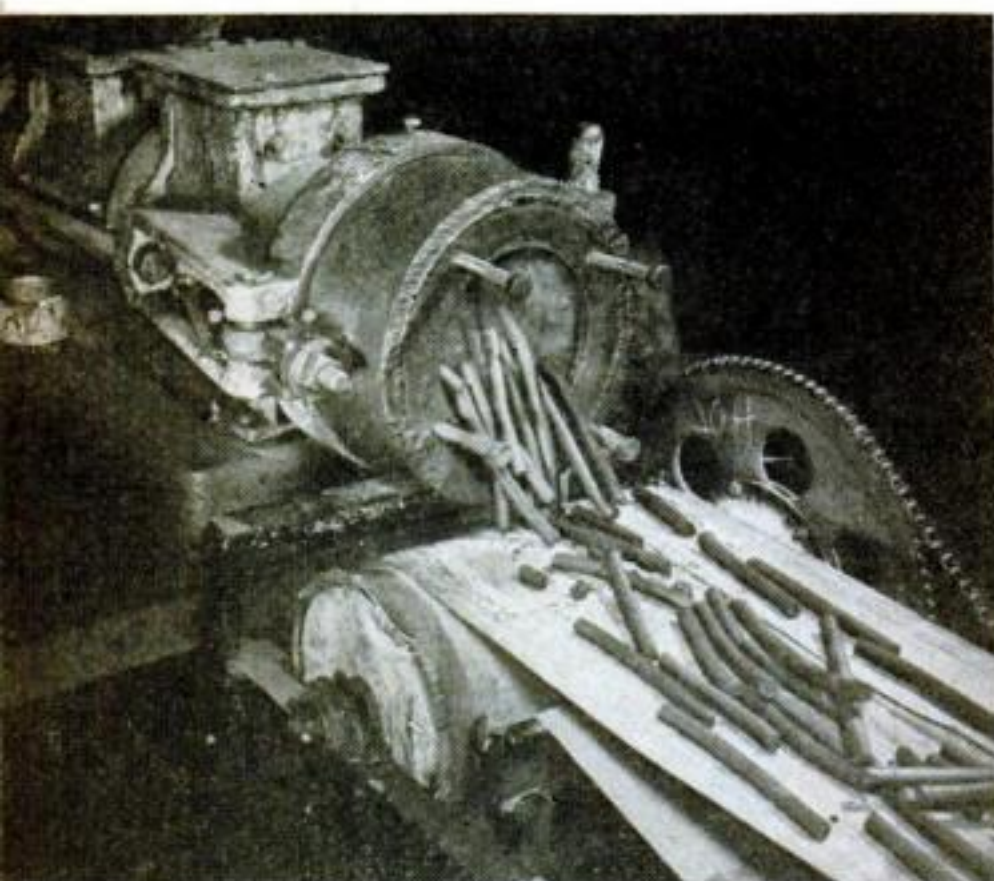
Silt pellets can be made in a variety of sizes, ranging from $\frac{1}{8}$ to $\frac{3}{4}$ in. in diameter. The large size shown is suitable for home furnaces; small sizes are tailored for various industrial uses.



Pellet making: Anthracite silt taken from the mountains of waste around mine heads is poured into the hopper of the pilot plant operating at the Anthracite Institute Laboratory.



Water is added as silt from the hopper passes through a pugmill, or mechanical mixer. No binder is needed in making the silt pellets by process developed at Wilkes-Barre, Pa.



After mixing, the silt is squeezed through the holes in the die of an extrusion machine. Emerging like black worms, the sections of pressed silt break off to form the pellets.



Pellets are dried as conveyer belt carries them slowly under bank of infra-red heat lamps. This reduces their moisture content from 18 to 5 percent and leaves them ready to burn.

machine that squeezes it through a sieve-like die. The diameter of the holes in the die determines the size of the pellets.

The wet extruded material emerges hot under pressure, breaks naturally into three- or four-inch lengths, and falls onto a conveyer-belt drier that carries it under a bank of infra-red lamps.

The larger sizes of pellets— $\frac{1}{2}$ and $\frac{3}{4}$ in.—can be hand-fired like coal into home furnaces and industrial furnaces not fitted with automatic stokers. Sealed in paper bags, they make an ideal packaged fuel for home fireplaces and outdoor grills. The $\frac{1}{8}$ -in. pellets are designed for use in furnaces with traveling-grate stokers. (Because they break

easily, the pellets cannot be used in screw-feed stokers.) Experts at the Anthracite Institute Laboratory see in them a substitute for coal in the furnaces of large industrial power plants—and in the power plants of the mines themselves.

Plants making $\frac{1}{8}$ -in. pellets right at the anthracite mines for use in their own power plants would free for other commercial use the 2,000,000 tons of barley coal a year now burned to power the mines. And since the silt already is at the mine heads, and the pellets could be fed to the furnaces as they were made, transportation would be practically eliminated.

So far, so good. But in their search for

ways to use the silt right at its source the laboratory's engineers came across another process. In a second pilot plant now operating in Wilkes-Barre, silt is transformed into fuel gas.

Fed into a tall reaction chamber, the silt, mixed with air and steam, is burned in a floating "fluidized" bed to form a gaseous mixture of carbon monoxide and hydrogen. This mixture, similar to the manufactured "water gas" burned in most kitchen ranges, could be fed directly to gas-fired boilers to produce power.

The secret of the laboratory's gasification process is the trick of producing a burning fluidized bed of silt, steam, and air. *There is no grate to support the fuel.* Instead it floats as a boiling, burning mass in a stream of air and steam inside the reaction chamber. The carbon in the silt combines with the oxygen in the water and frees the hydrogen to produce a mixture of carbon monoxide and hydrogen.

Silt to Gasoline

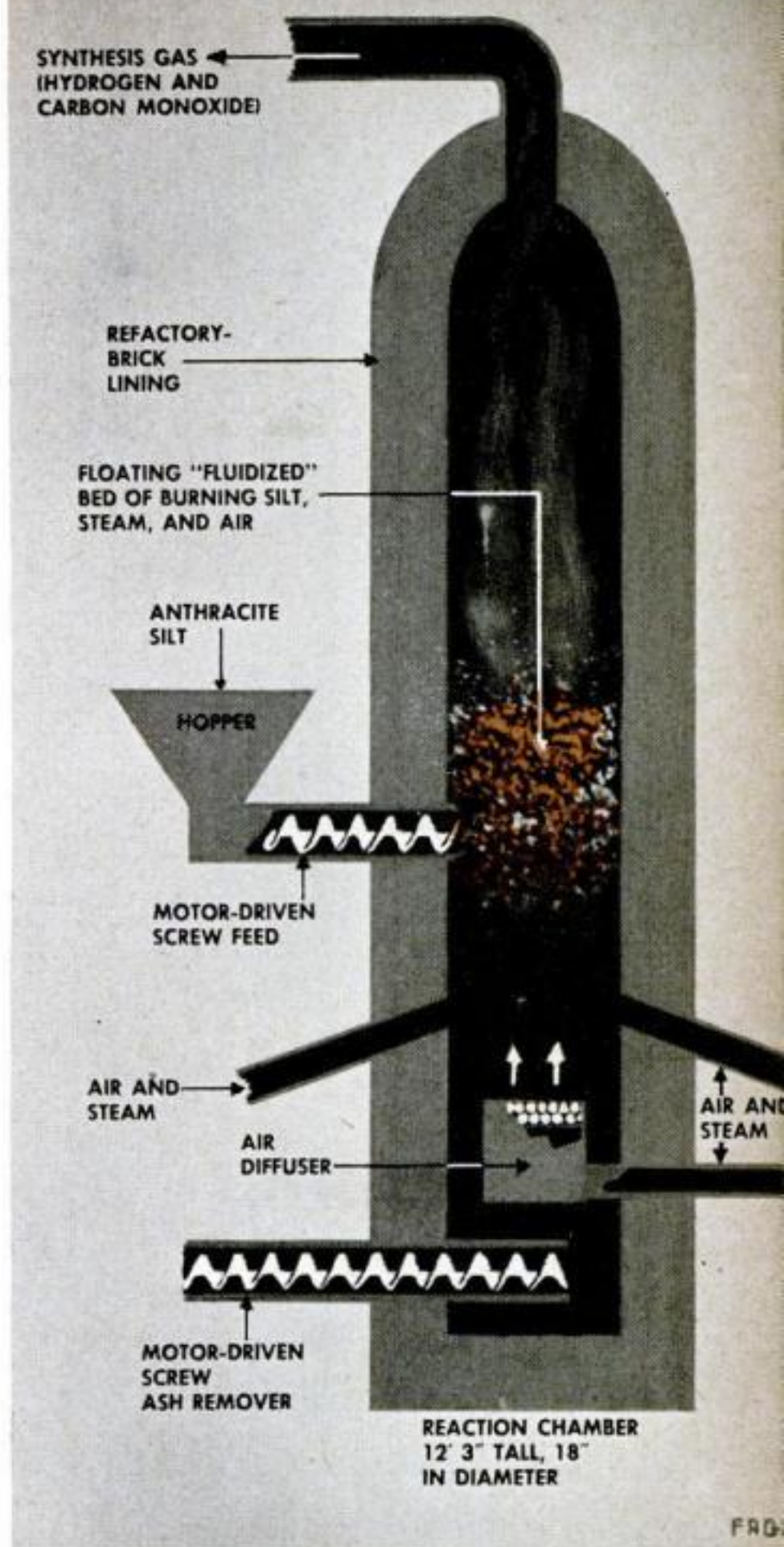
There is still another and perhaps even more important future for the dumps of silt that besmirch Pennsylvania's 484 square miles of coal fields. This is suggested by the experimental work on producing synthetic gasoline from coal and natural gases that is forging ahead in at least a dozen pilot plants throughout the country. In reaction chambers similar to that now in operation at the Anthracite Institute Laboratory, silt too can be transformed into the gases needed as the basic materials for the synthesis of gasoline and oil.

Speculating on the future, Dr. R. C. Johnson, the man in charge of the Anthracite Institute's research, sees the possibility of a continuous pipeline operation in the production of synthetic fuels. As he envisages it:

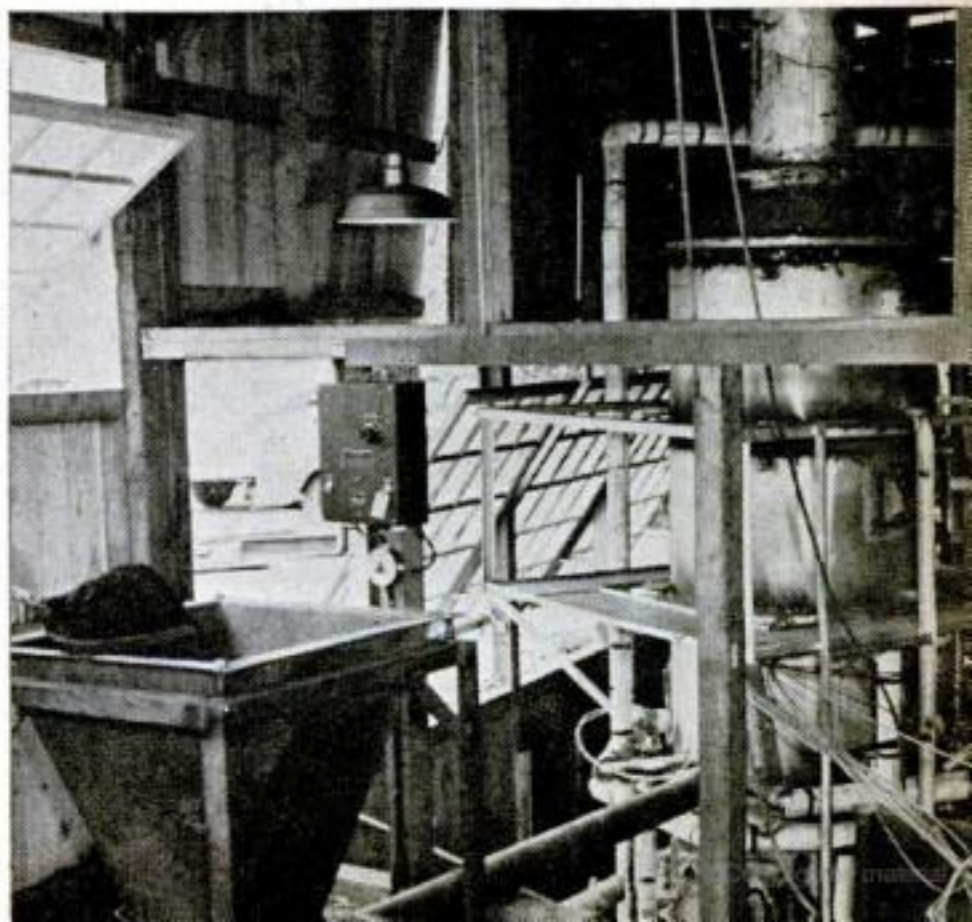
A network of pipelines from the many mine heads in the anthracite area could bring the silt to a central synthesis plant. There it could be burned in reaction chambers, and the resulting carbon monoxide and hydrogen could be fed directly to the synthesis reactors. The resulting synthetic gasoline and oils could then be piped—just as the natural products are now—to the consumer localities.

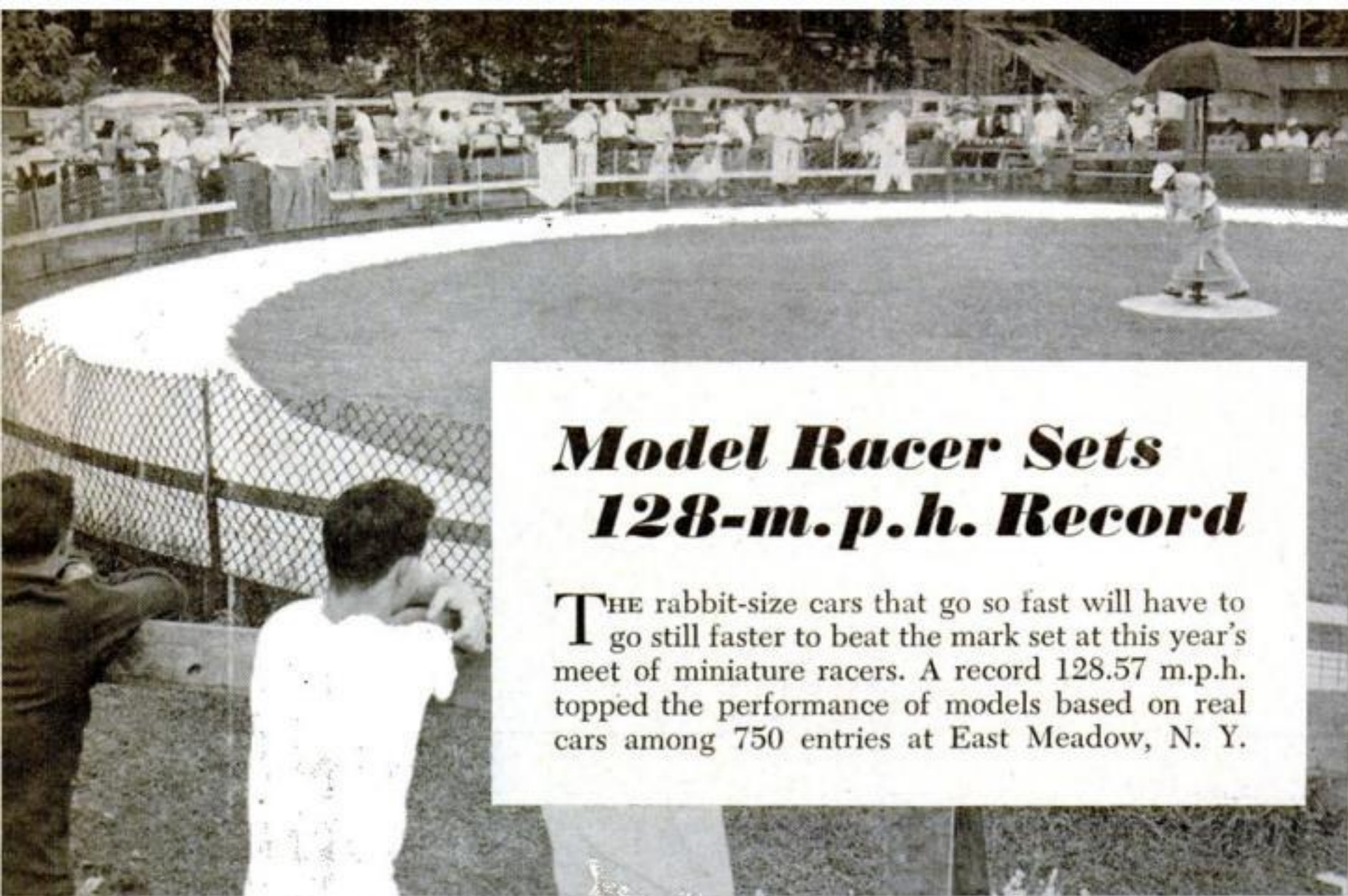
One of these days you may be running your car on man-made gasoline whose basic ingredient was once an eyesore on the Pennsylvania countryside.

END



Gasification is another method developed by Anthracite Institute for burning silt. Drawing shows how this occurs in reaction chamber where silt floats as liquefied mixture with air and steam. Resulting gas is same as that used for making synthetic gasoline and oil from coal.





Model Racer Sets 128-m.p.h. Record

THE rabbit-size cars that go so fast will have to go still faster to beat the mark set at this year's meet of miniature racers. A record 128.57 m.p.h. topped the performance of models based on real cars among 750 entries at East Meadow, N. Y.

Barely visible blur (arrow) is 100 m.p.h. car held to track by wire from central pivot (right).



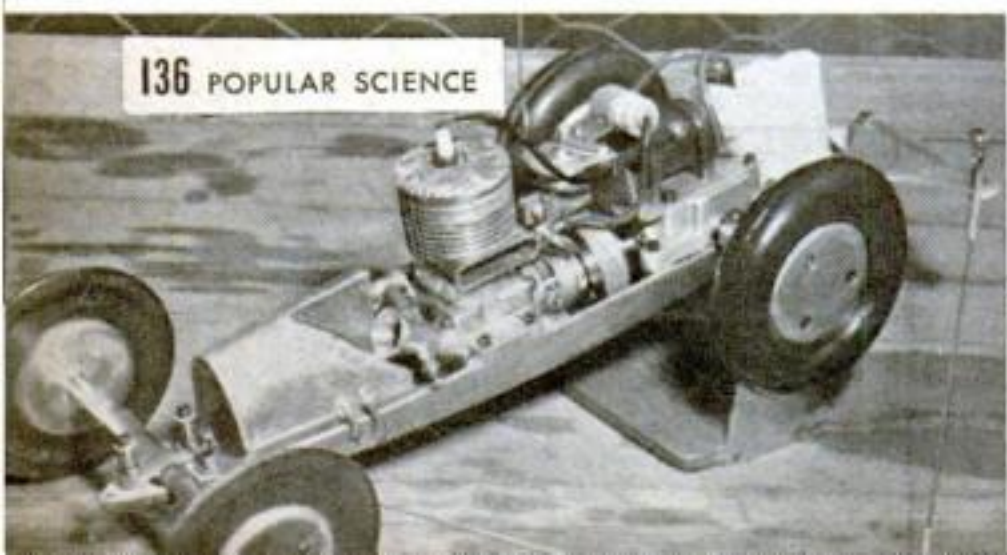
Big attraction was Frank Brennan's jet job. Its pulse engine, patterned after Nazi buzz bomb, makes 150 m.p.h. speed—and noise heard eight miles away. It did not race standard models.

Removal of cover shows motor of record-breaking *Challenger*. Motors like this turn at 36,000 r.p.m.—pleasure cars do only 3,600—on fuel mixture of methanol alcohol and castor oil.



Stopping racers is delicate job. Here owner trips fuel-shutoff wire with his cap. Car, doing 120 m.p.h., is blurred even though picture was made at 1/1000-second shutter speed.

Lt. Col. John Coppage displays his 128-m.p.h. *Challenger*, winner in prototype class—models copied from full-size racers. Other class, called streamliner, permits any design to boost speed.



136 POPULAR SCIENCE



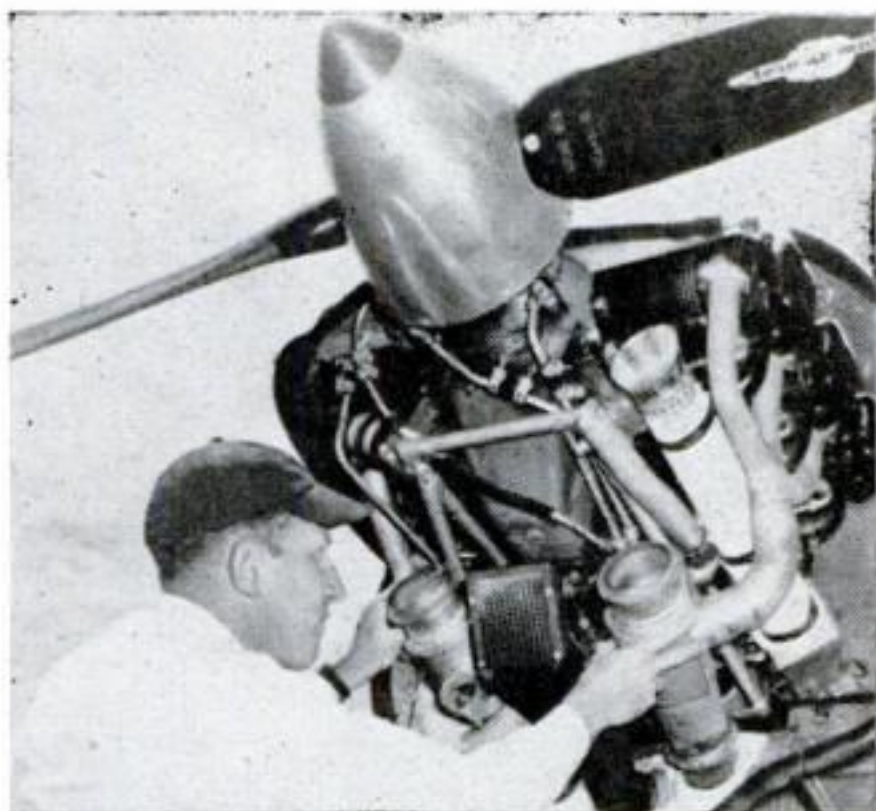


Raft Has Radar Target

HERE'S the latest in life rafts—a rubber dinghy, being tested by Britain's Royal Navy, that has practically everything but its own engine. Folded for carrying, as shown at left, it weighs only 200 lb. When inflated by jerking the rip cord on a bottle

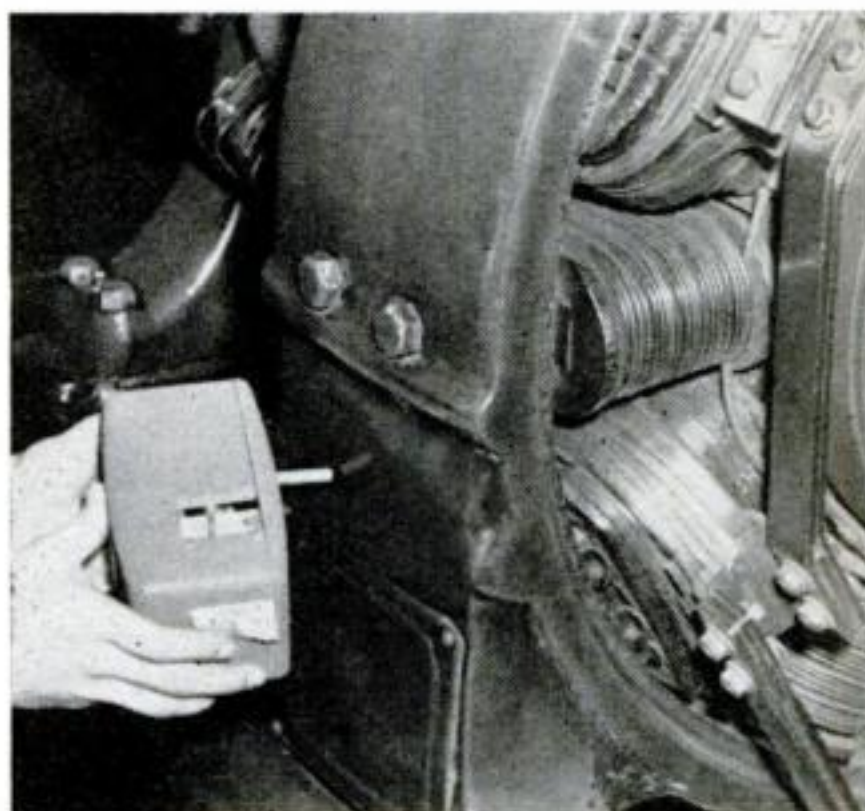


of carbon dioxide, it resembles a huge automobile tire. The tent, with a floor of rubberized fabric, shelters 10 men, and its telescopic center pole is topped by the antenna of a radar device to guide rescue ships. Other equipment includes inflated pillows, paddles, baler, sponge, and containers of food and water.



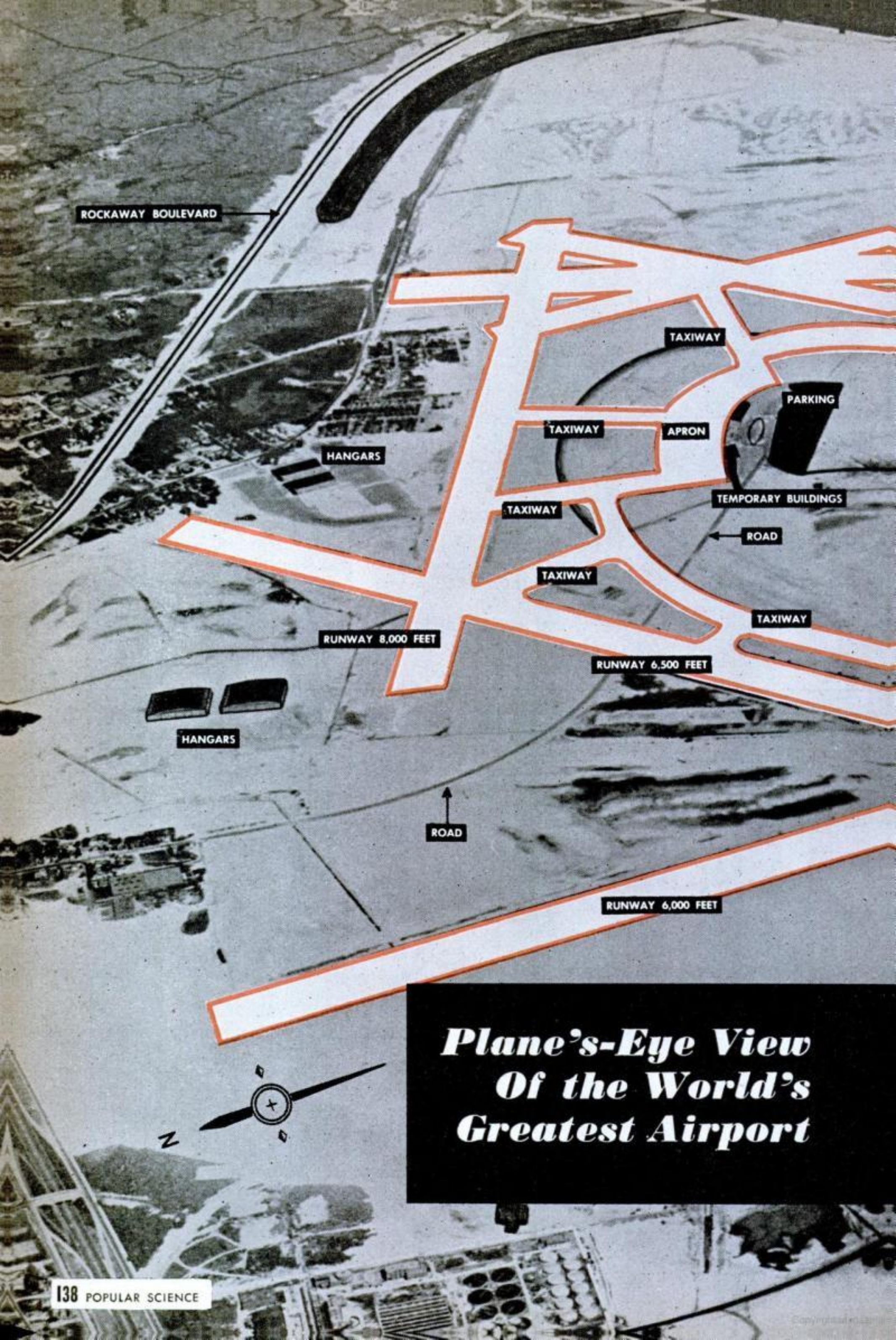
CAA Tests Plane Muffler

A NEW airplane silencer, shown above during CAA tests, works just like a car muffler—but without cutting down engine power by retarding the flow of exhaust. Instead, a stream of air blasted back from the propeller sucks the exhaust through a series of baffles in a pair of stubby, open cylinders. The device was invented by Curtiss Davis, of San Francisco.



Box Records Vibration

THIS little box with a rod sticking out of its side is a "recording vibrometer" developed by General Electric. When held against a piece of machinery, as shown, the device writes down how much it shakes. The vibrations are transmitted by the prong, magnified 12 times by a spring, and passed on to a sapphire point that scratches jerky lines on a moving tape of waxed paper.



ROCKAWAY BOULEVARD

HANGARS

TAXIWAY

PARKING

TAXIWAY

APRON

TAXIWAY

TEMPORARY BUILDINGS

ROAD

TAXIWAY

TAXIWAY

RUNWAY 8,000 FEET

RUNWAY 6,500 FEET

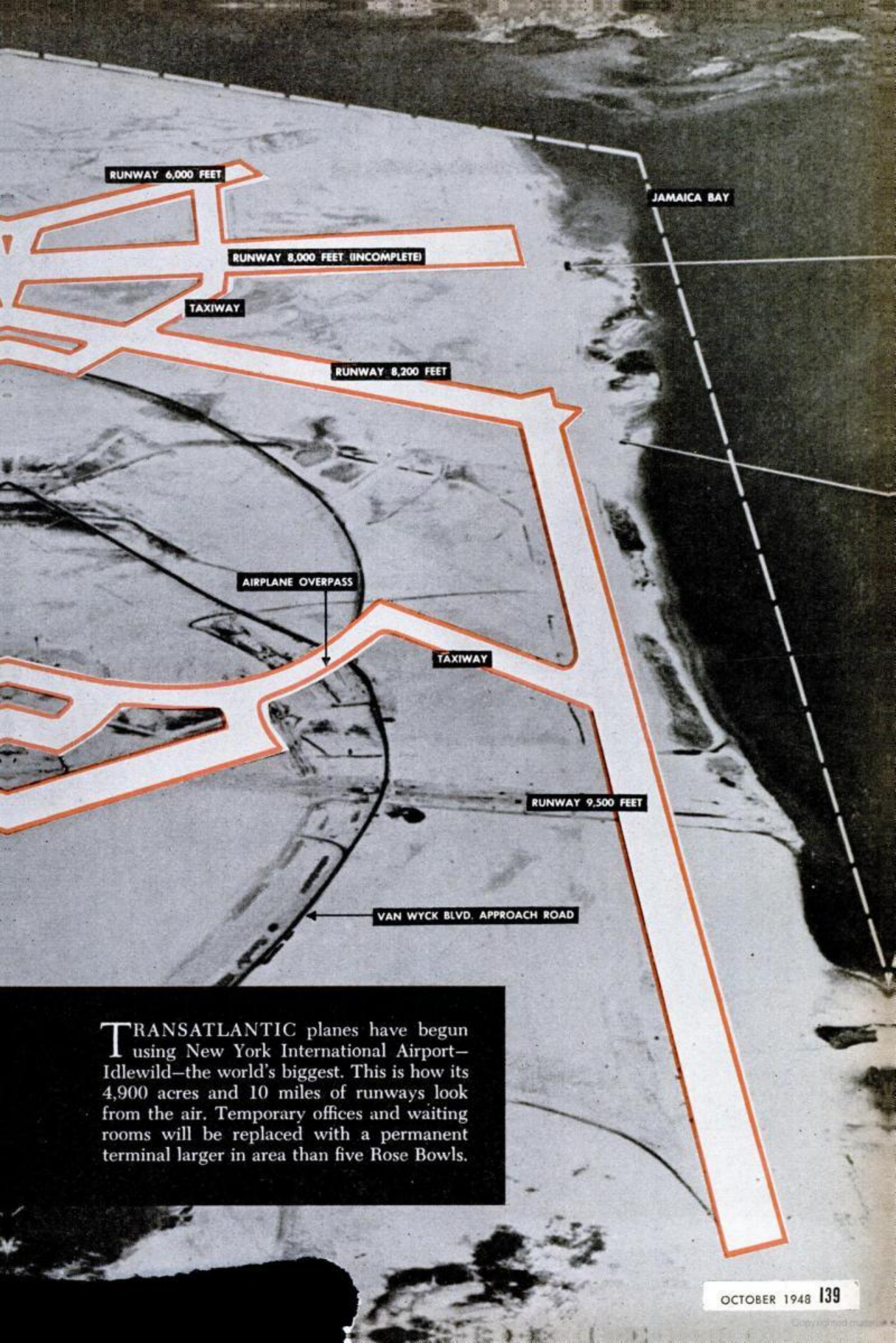
HANGARS

ROAD

RUNWAY 6,000 FEET

***Plane's-Eye View
Of the World's
Greatest Airport***





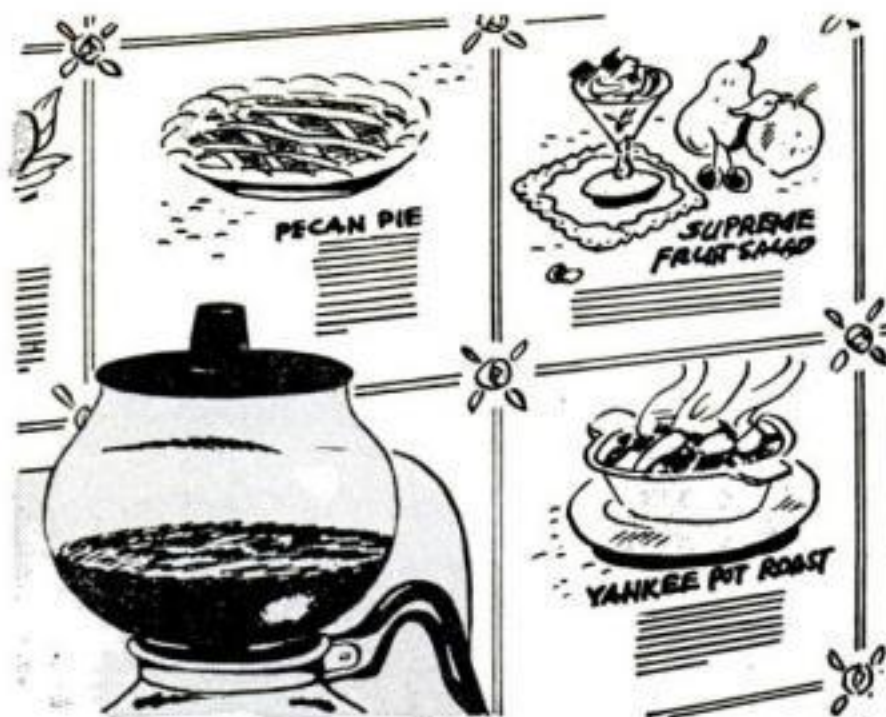
TRANSATLANTIC planes have begun using New York International Airport—Idlewild—the world's biggest. This is how its 4,900 acres and 10 miles of runways look from the air. Temporary offices and waiting rooms will be replaced with a permanent terminal larger in area than five Rose Bowls.

I'd like to see them make...

Everybody has his own pet idea of some gadget he would like to see in general use. What is YOURS? Popular Science will pay \$5.00 for each one published. Use government postcards only. Contributions cannot be acknowledged or returned.



Round corners in window frames. This would simplify the job of cleaning them. The way it is now, you usually chip your nails digging dirt out of the square corners.—Mrs. James Gardner, Hoquiam, Wash.



Kitchen wallpaper with pictorial recipes printed on it. A washable wall covering with the recipes of individual dishes and entire meals on it could save the housewife a lot of time.—May Hall, Fitchburg, Mass.



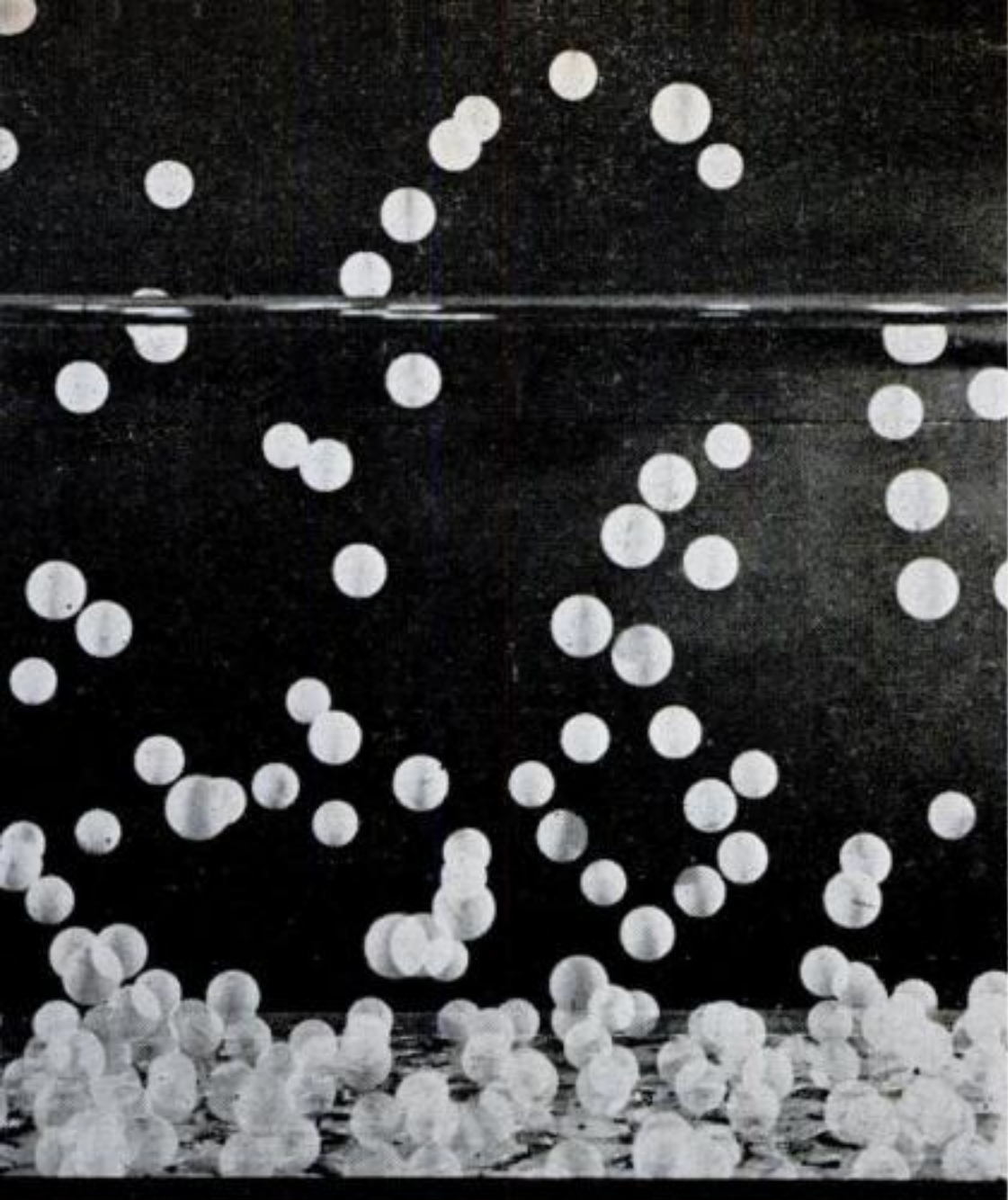
Ink eradicator in fountain pens. One end would be an ordinary pen, but I want the other to contain an applicator and eradicator protected by a removable cap.—Edward W. MacGrath, South Orange, N. J.



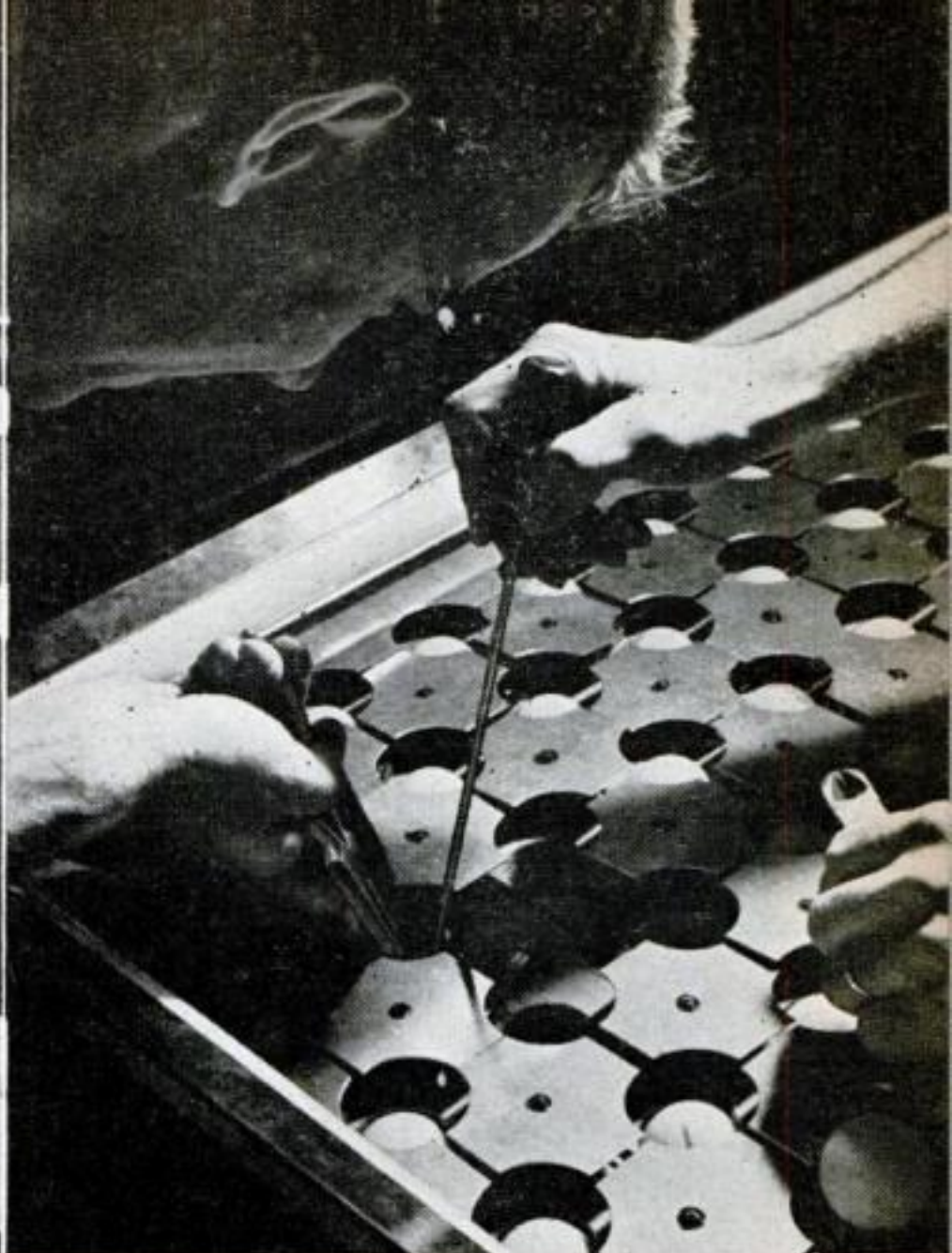
A flat vacuum bottle shaped to slip snugly into a man's coat or trouser pocket. The present round ones are too bulky and you have to lug them to and from work by hand.—Robert B. Tweedale, Brooklyn, N. Y.



Magazine holders on the side of barbers' chairs. Then when you finished one magazine or newspaper, you could just pick another from the rack without interrupting the haircut.—M. D. Levin, Waukegan, Ill.



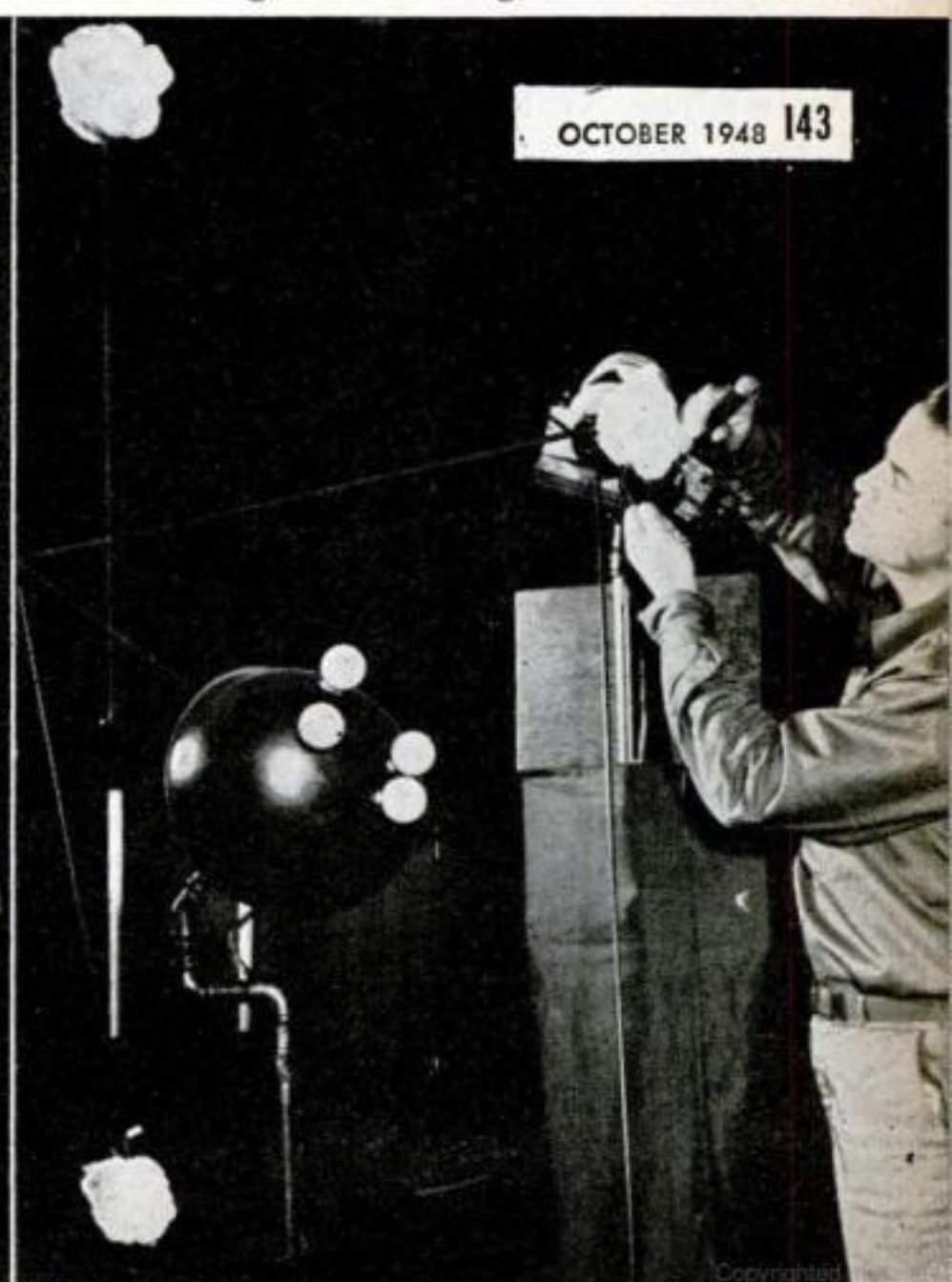
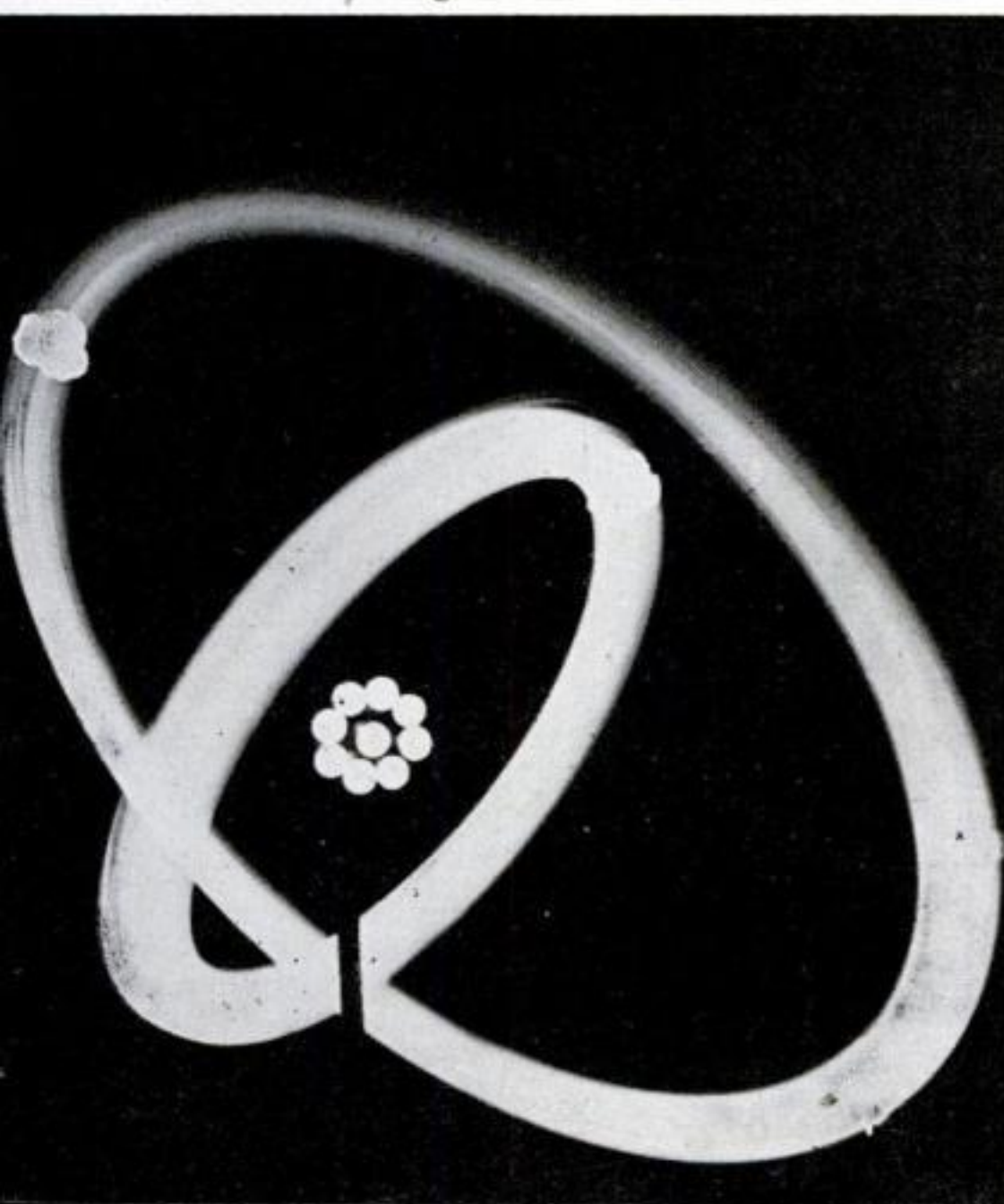
Balls representing neutrons are shot upward through holes in the bottom of the model pile, then fall back, tripping switches that release more balls. With sufficient number of switches operating, chain reaction is self-sustaining.



Pile's mechanism is made from parts of 67 police-confiscated pin-ball machines. Balls are shot upward from holes by plungers activated by solenoids. Odd-shaped plates are switches that work solenoids when tripped by falling balls.

Working model shows an atom magnified 10 million times. Nucleus of protons and neutrons is represented by central cluster of phosphorescent balls, electrons by phosphorescent wads of cotton whirling around on the ends of arms.

Atom model consists of two self-synchronizing Selsyn ® motors rotating arms to which are attached the wads of cotton. An old Army helmet on a pipe stand is the nucleus. On it, balls cemented to magnets are arranged in desired order.





RESIN + GLASS = "GOO"

Raw materials. Two barrels of resin and 12 rolls of fibrous glass mat are the basic materials that go into new boat's 2,800-lb. hull. Applied

in layers, the resin and glass form a gooey mass that hardens in a few hours under pressure and heat into a single piece of tough, flexible plastic.

Biggest Molded Plastic

Made in 6 hours like huge piecrust, one-piece hull for 28-ft. personnel carrier is tougher than steel.

By George H. Waltz, Jr.

PS photos by Hubert Luckett

RUGGED plastic boat hulls as big as a moving van now can be built by six men in six hours. They are literally molded and baked like huge piecrusts.

The first of these revolutionary plastic boats—one of several being built for the Navy for development purposes prior to full-scale production—has just completed its test runs on the Delaware River at the Philadelphia Navy Yard. A new type of personnel carrier, it has a length of 28 ft. 9 in. and a beam of 10 ft. 3 in. It is powered by two gasoline engines. It can transport 22 men, including a crew of two, at better than 19 knots.

The new boat is an important "first" not

only for the Navy but for the plastics industry: it is the first military craft to have a plastic hull, and it is *the largest single plastic object ever molded in one piece*. To build a comparable wooden hull would take six skilled workers at least 60 hours.

But the value of the new plastic boat goes far beyond its ease and speed of manufacture. A plastic hull never needs a painting; the desired color, added during the molding process, is uniform throughout the plastic and lasts as long as the hull. It can be wiped clean as easily as your bathtub. It is impervious to such natural enemies of wood hulls as fungi, bacteria, termites, and ship worms. And it will not scuff, scratch, check, or split under the toughest tests the Navy has been able to think up.

The plastic used in the hull—resin reinforced with sheets of fibrous glass matting—is about 2½ times stronger, weight for weight, than steel in tension or in flex. It has three times the strength of wood under



+KNOW-HOW=NAVY BOAT

Finished product. Here is the new personnel carrier on a test run near Philadelphia Navy Yard. Cast in a giant aluminum mold like a

huge piecrust, the one-piece plastic hull is practically indestructible. The material can be cut and drilled with ordinary metalworking tools.

Makes New Navy Boat

conditions of stress, where wood is at its best, and is 12 times stronger than wood in shear parallel to the grain. If necessary—though the men who make the boats insist it won't be—the plastic can be mended with a glass-mat patch cemented on with resin.

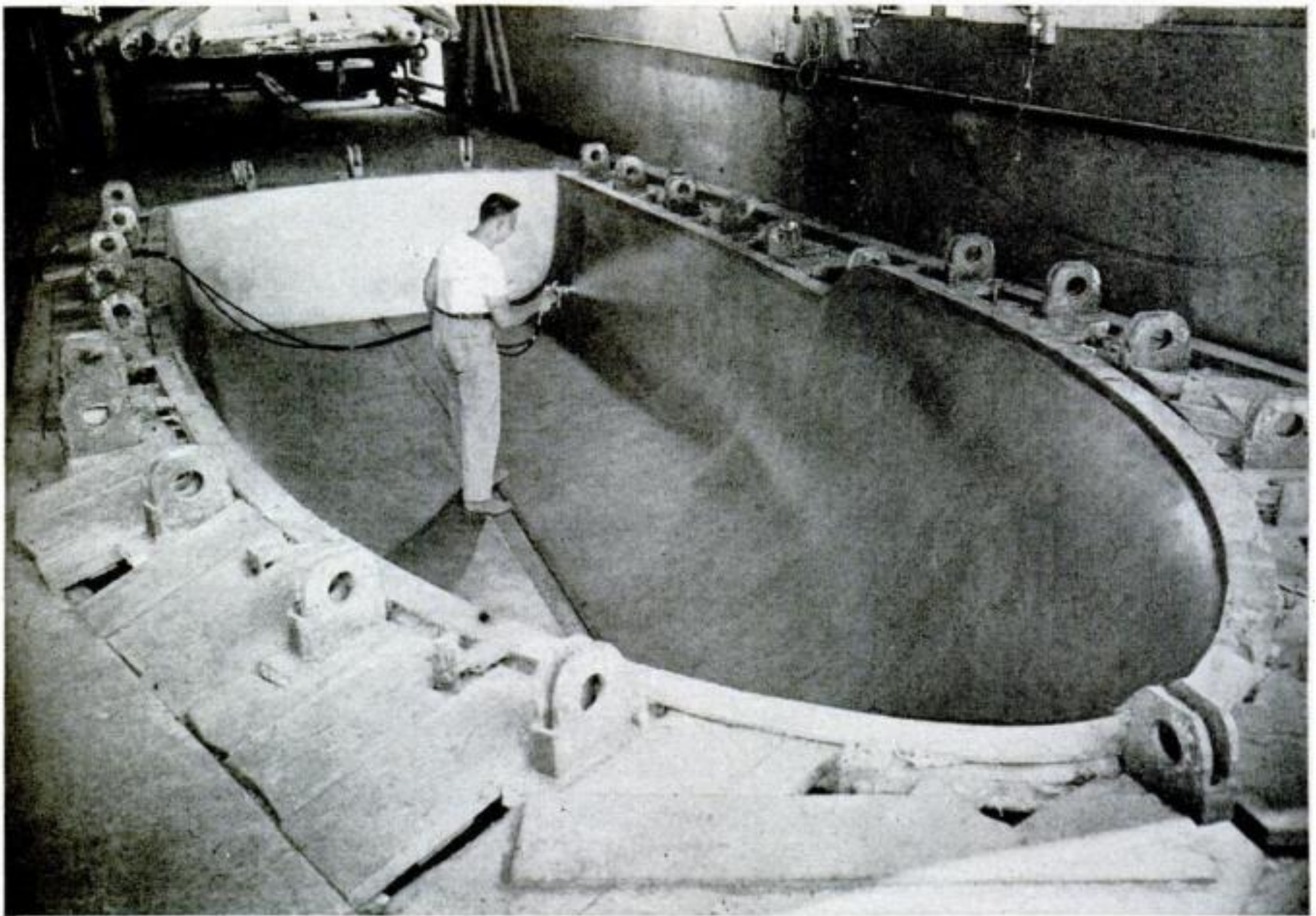
From the ship designer's point of view, the new method of making hulls is ideal. Practically any kind of hull form, no matter how complex, can be constructed this way. Sharp double curves, difficult if not impossible to form in wood, can be constructed easily in molded plastic.

After riding in the new boat while naval experts put it through its paces, PS photographer Hubert Lockett and I visited the West Trenton, N. J., plant of the Winner Manufacturing Company, where the plastic hulls are made. There we saw the aluminum form used to mold the hulls and learned from the engineers and technicians more about the tough resin-and-glass plastic that is going into the Navy's new boats.

The method of producing the big hulls is simplicity itself. Except for the great size of the operation, it is very much like baking the hollow shell for a pie. The giant, steam-heated aluminum mold is the piepan; the plastic is the dough.

At the start of the operation, a coat of "parting" liquid is sprayed on the inner surface of the mold—much as a housewife greases her baking pan—to allow the completed hull to be lifted easily out of the mold. On top of the parting coat goes the first spray coat of resin, which has been tinted the desired color. Sections of Fiberglas[®] mats, cut to predetermined sizes and shapes, are laid over the resin.

More resin then is sprayed on. After it, more sections of fibrous glass are added, followed by another coat of resin. These layers of resin and glass fibers are put one on top of another until the desired thickness at each point on the hull is obtained. On the finished hull, the sections near the keel are



Body of the mold, made of $\frac{1}{2}$ -in. welded aluminum plate, is set into floor of manufacturing plant. Steampipes surrounding it provide the

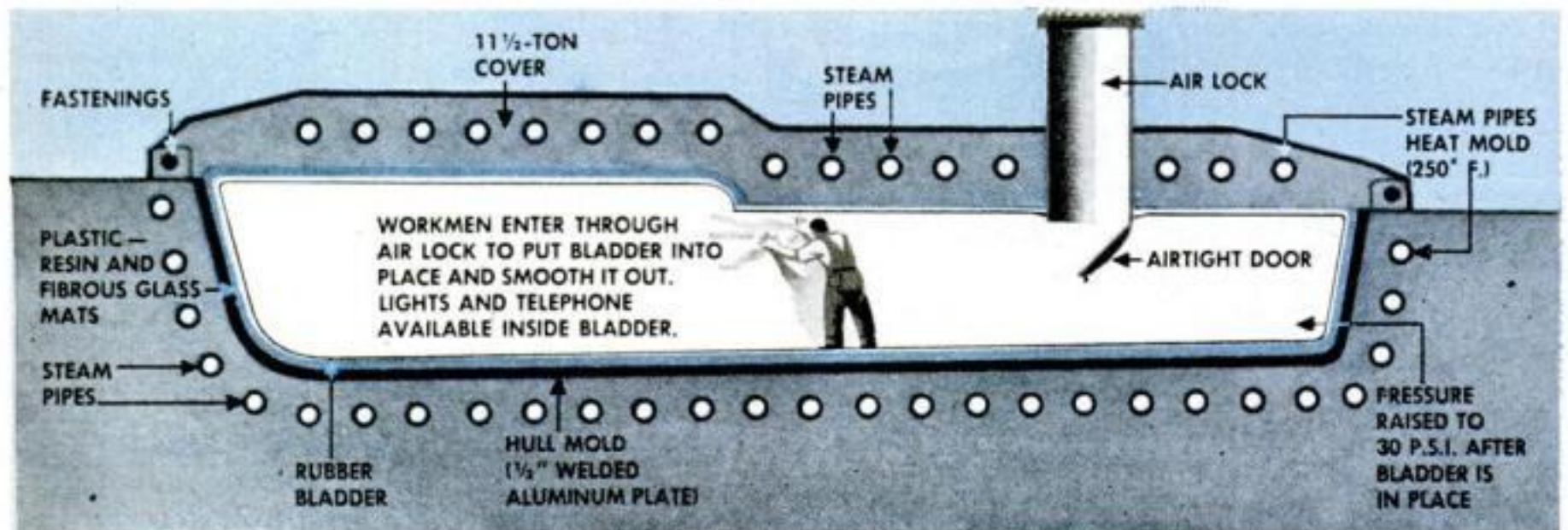
heat necessary for setting and curing. Here, workman is spraying the inside with a lubricating liquid before laying on first coat of resin.

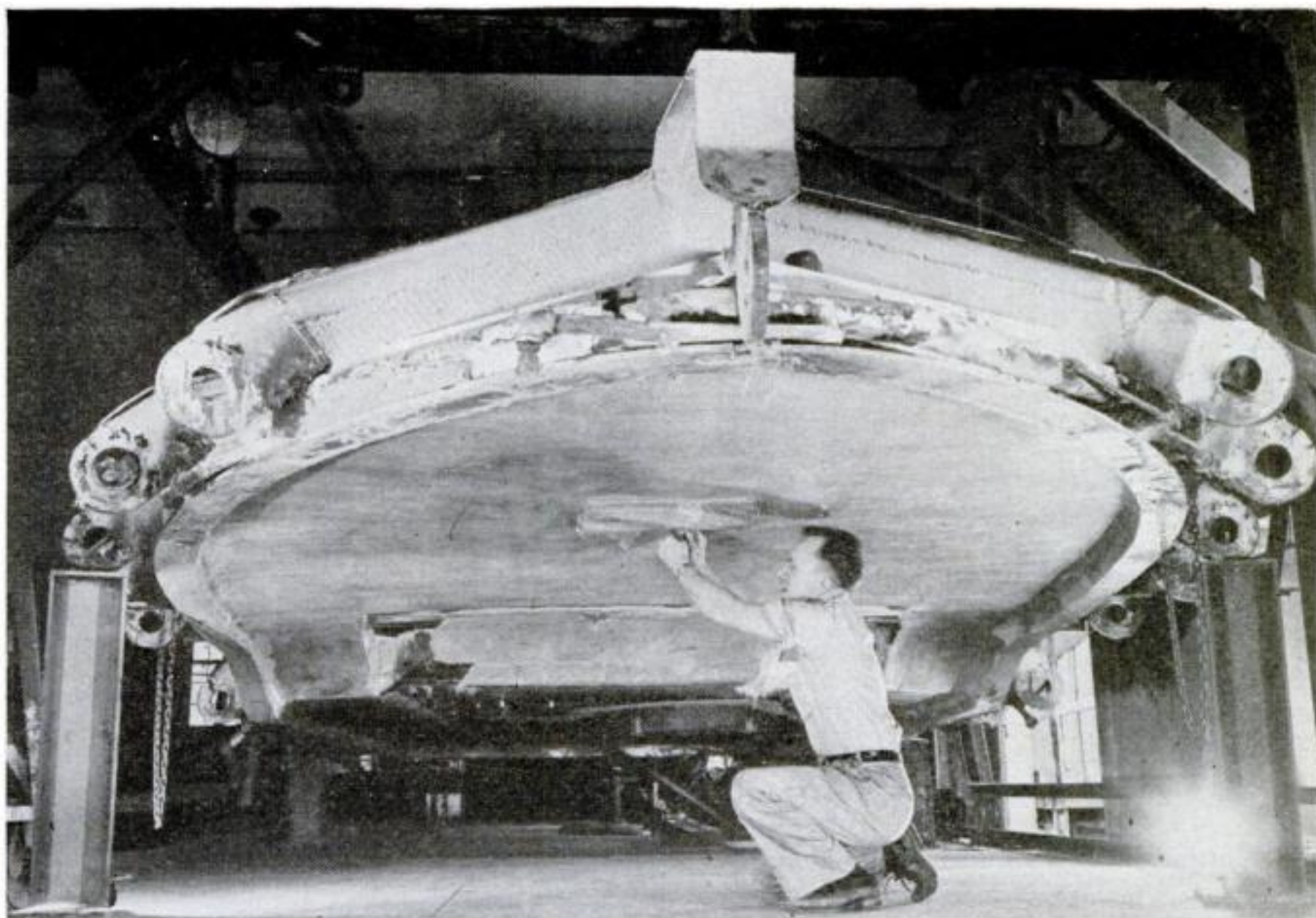


Strips of glass matting are put in place after each coat of resin. Then more resin is sprayed on until desired thickness of hull is built up.



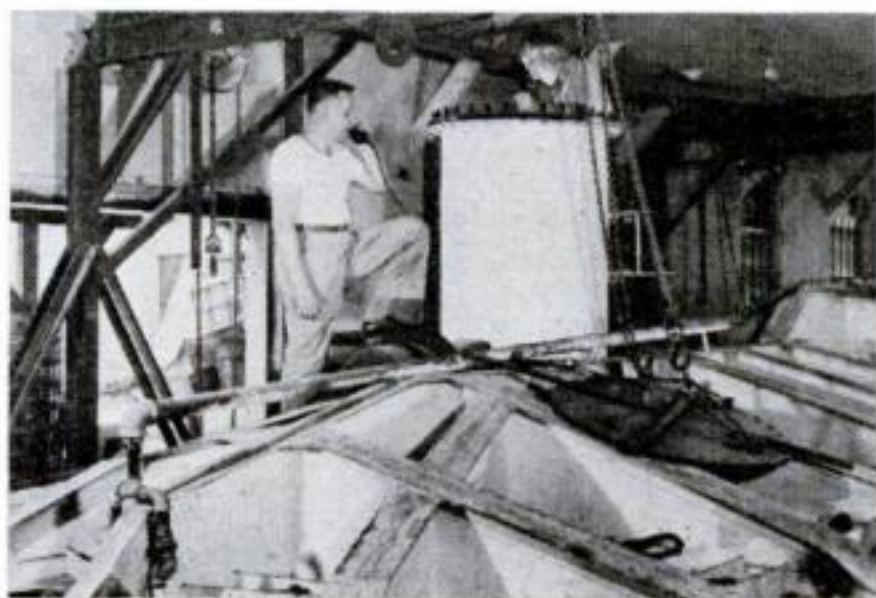
Rubber bladder, to be placed inside mold and inflated, will push layers of resin and glass matting out against the inner surface of mold.



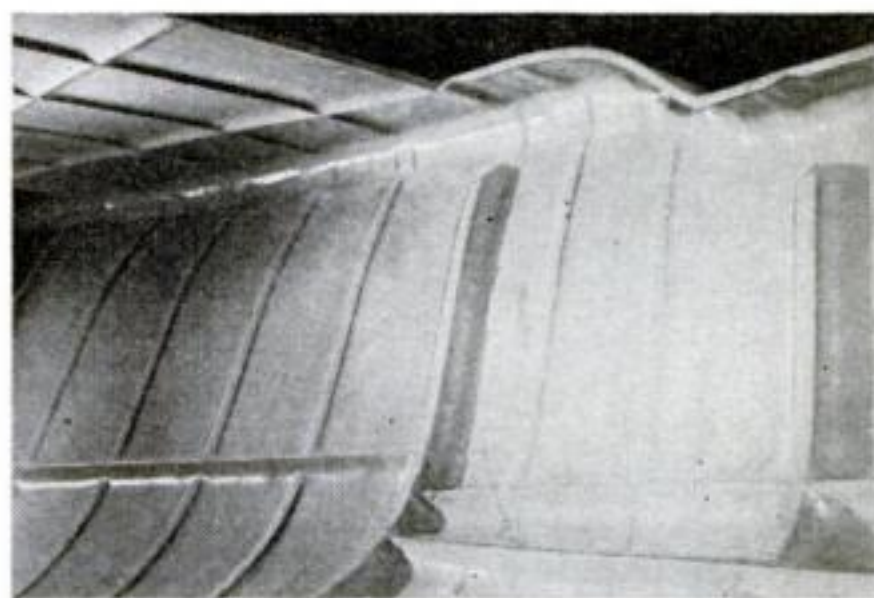


Top of mold, weighing $11\frac{1}{2}$ tons, is lowered into place after "laying up" of resin and glass mats is completed and rubber bladder has been

put into main body of mold. Top, too, is honey-combed with steampipes for baking the hull. Rings around its rim are for locking it down.



Conning tower in top of mold is an air lock to let workmen enter bladder within mold to smooth it out for good contact with plastic.



Ribs inside hull are formed by placing laminated-wood frame in mold during "laying up" and covering it with more glass and resin.

layered up to half-inch thickness, thinning to a quarter-inch at the gunwales.

Half way through the process, a frame of laminated oak ribs is fitted into place, and the remaining layers of resin and glass are applied. This frame is not for strength, but to serve as an inner mold to form the plastic ribs and raised members for mounting the engines, seats, bulkheads, and other equipment.

Once the "laying up," as this part of the process is called, is completed, a blimplike

rubber bladder is placed in the mold, the plastic for the foredeck applied, and the mold's cover is lowered.

This cover looks much like the deck of a small submarine, complete with a conning-tower entrance. When the cover has been fastened, workmen climb down inside the bladder. The conning tower's air-tight doors then are closed, and air is pumped into the bladder.

Working inside the bladder within the mold, the men ease the big rubber bag into



Complex curves, difficult to form with wood, can be designed into plastic hull. Although wood trim is used on Navy plastic boat, this too could be made of laminated glass and resin.

place, smoothing wrinkles. This done, the men leave via the conning-tower air lock.

Placing of the rubber bladder inside the mold is a particularly important part of the hull-building process; for it is the bladder that forces the layers of resin and glass evenly against the inner surface of the mold.

Pressure within the bladder then is built up to 30 pounds per square inch, resulting in a total internal loading of about 1,500 tons, and steam is turned into a network of pipes surrounding the mold. The pie is in the oven for the final setting and curing at 250° F.

A few hours later, the heat is turned down, the cover and the bladder are removed, and the 2,800-lb. hull is lifted out of the mold. Except for a little cleaning up here and there, it's ready to be fitted out with cabin, engines, and other equipment.

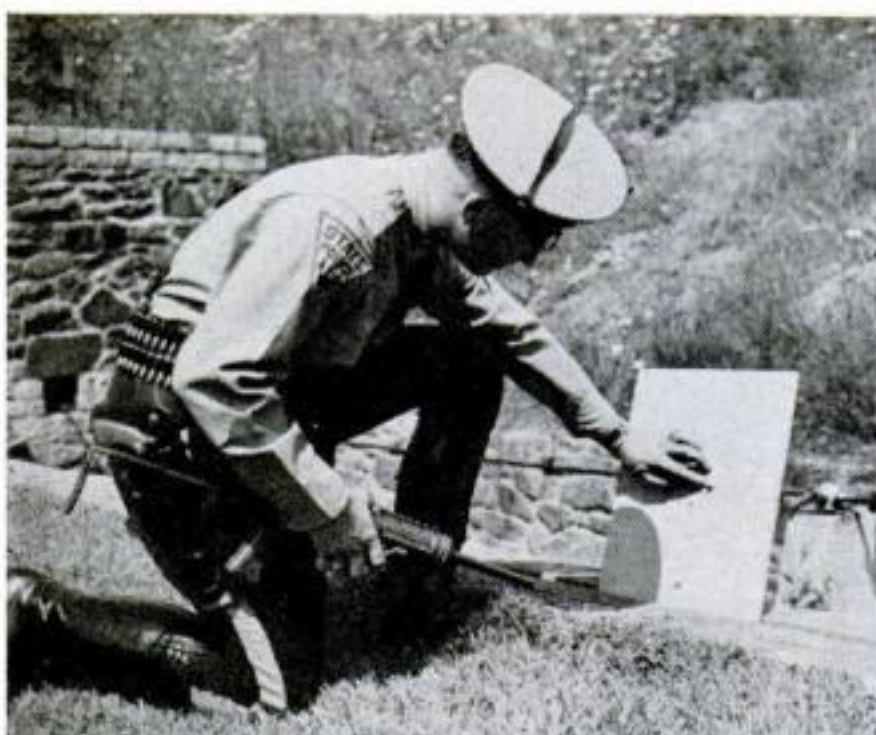
Making boats of plastic is not new to the Winner company's engineers. For several years they have been turning out small plastic runabouts and sail boats. Pictures on this page show two of the demonstrations they like to put on to prove the ruggedness of these pleasure craft.

Their ability to take abuse is what first brought experts of the Navy's Bureau of Ships to Winner's West Trenton plant.

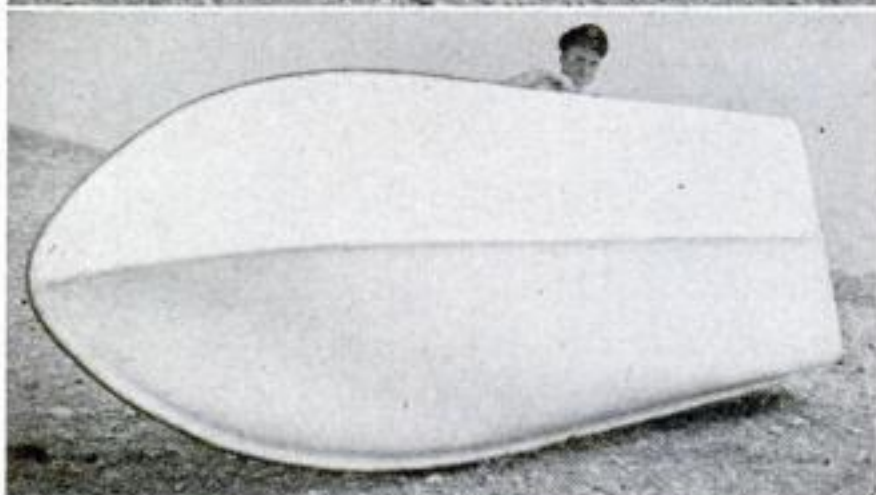
Thinking in terms of bigger and bigger boats, I asked Robert Drake, Winner's chief engineer, about the possibility of building plastic hulls for craft even larger than the Navy's new personnel carrier.

"Engineeringwise," he replied, "we're ready to build plastic hulls up to 100 feet in length right now!"

END



Slugs from .45-caliber sub-machinegun, fired at 10 paces, fail to penetrate $\frac{1}{2}$ -in. thickness of plastic used for boat hull. New Jersey state trooper is shown examining panel after the test.



Ruggedness of plastic hulls is demonstrated by Robert Drake, chief engineer of plant that made new Navy boat. Gunning its outboard motor, he drives small plastic runabout up on gravel beach at 30 m.p.h. As shown in lower photo, this rough handling didn't even scratch the hull.



Folding Grand Piano Stands on Edge

THE Consolegrand [®], shown above, solves a problem for pianists who aren't satisfied with an upright model but haven't room for a conventional grand piano. When not in use, it can be turned on edge and pushed out of the way against a wall.

To make the change, you just press two levers under the keyboard—and lift up. The body of the piano pivots to a vertical posi-

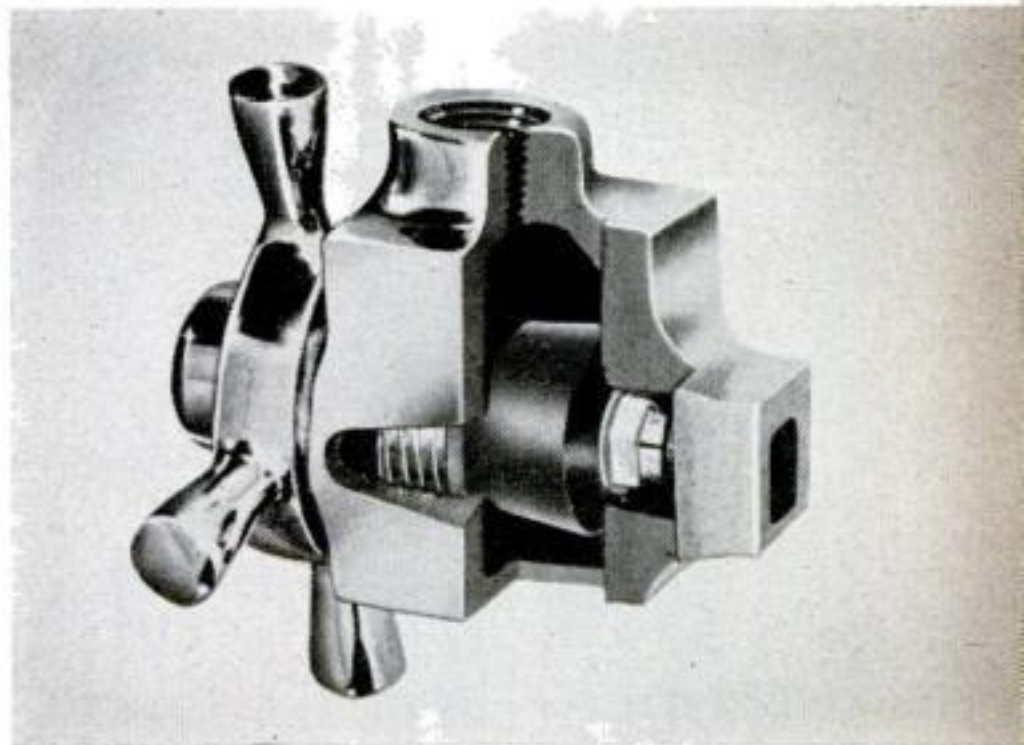
tion, as at right above, and rests against a cross beam that holds it upright. Both levers must be held down at the same time to release the lock, and they're placed too far apart for children to reach. A little push on the upright piano lets you tilt it down into playing position.

Krakauer Bros., of New York City, make the new piano in several finishes.



Crib Guard Bars Tumbles

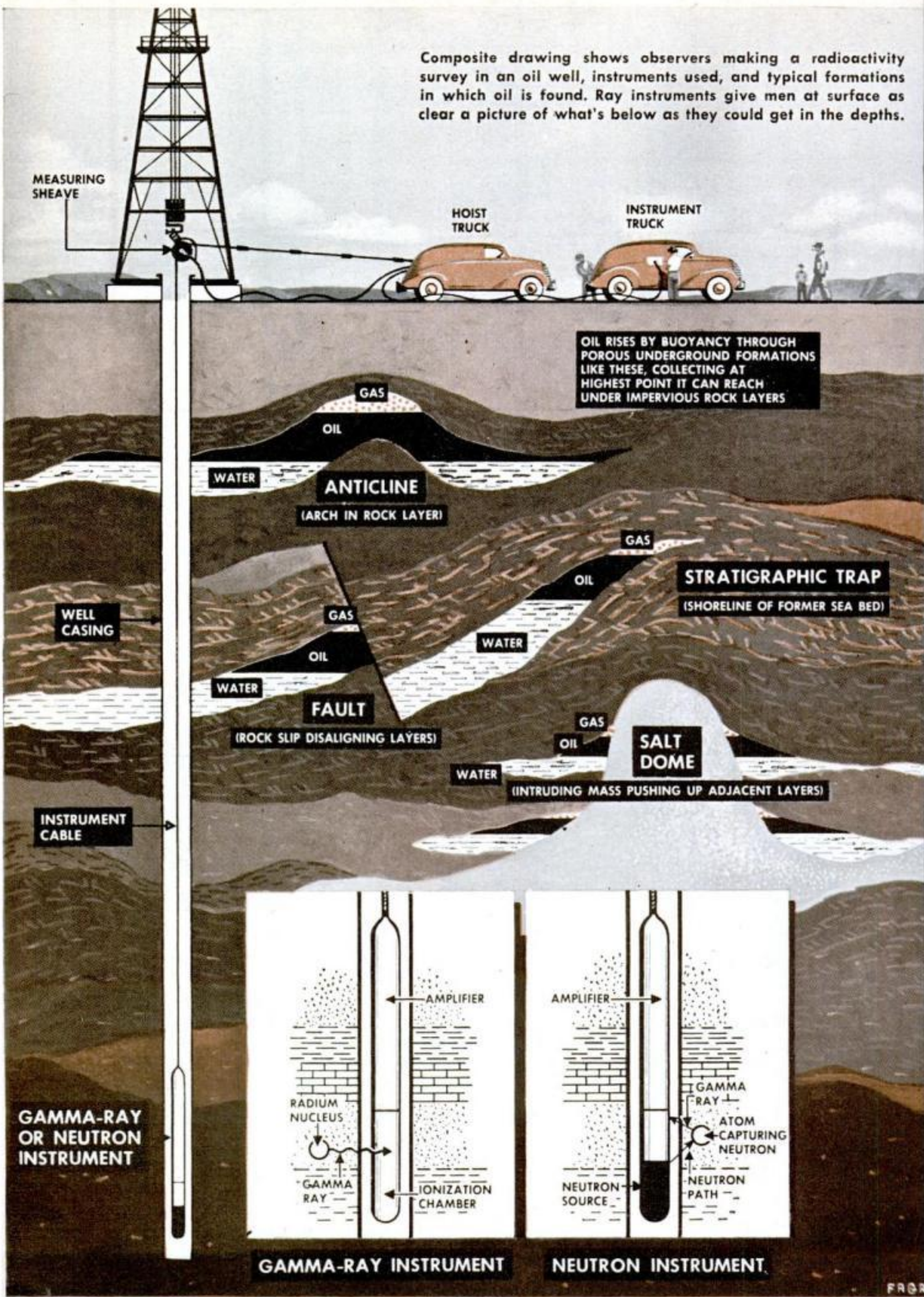
THE Tot Guard [®], clipped over the side of a crib as shown above, helps to keep a child from climbing or falling out. For good measure, it can also sing him to sleep with the dulcet tones of Brahms' "Lullaby" from a built-in music box. Held tight by six bolts through its two parallel sheets of plywood, the safety extension, together with a removable plastic teething rail, adds a critical 8 inches to the side of any standard crib: R. Barbara Blanke Creations, Inc., of New York City, makes the guard.



Faucet Can't Leak

THE torturing drip, drip that has caused many a sleepless night can be a thing of the past, according to the manufacturer of the dripless faucet illustrated above. When the handle is released into its natural position, pressure of the water against a heat-resisting, synthetic-rubber diaphragm automatically closes the outlet. Tests made by the Western Faucet Co., Portland, Ore., indicate that the device will withstand 100 daily operations for 30 years. It is called the Drip-Lok Free Wheeling Faucet [®].

Composite drawing shows observers making a radioactivity survey in an oil well, instruments used, and typical formations in which oil is found. Ray instruments give men at surface as clear a picture of what's below as they could get in the depths.



Sipping Oil Through a Four-Mile Straw

Giant machines, "ray guns," and new explosive aid drillers seeking petroleum at record depth in earth's mystery zone.

By Andrew R. Boone

CAN drillers tap the world's deepest oil pools—believed to lie four miles or so beneath the earth, in a mysterious region of scorching heat and fantastic pressure?

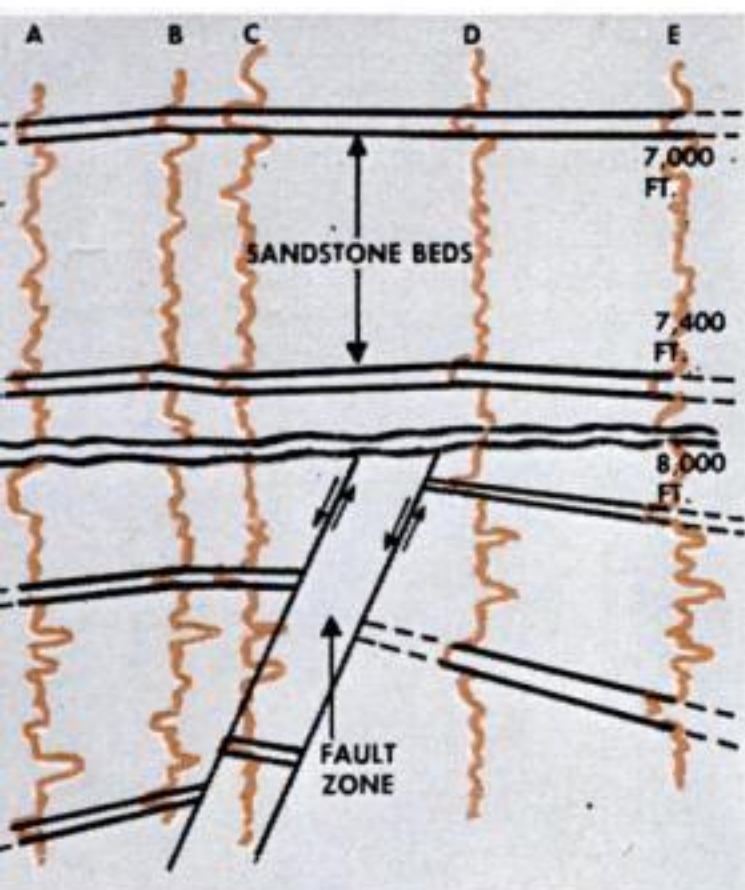
Ever-increasing demand makes that oil needed, to heat homes and buildings and to power cars, Diesel trains, and ships. And now the experts are going after it.

No one has ever set eyes on the earth's interior four miles down, about twice as far as men have descended in the deepest mine. But such ultramodern instruments as radioactive "ray guns" rival any of fiction. Low-

ered as far as drills can bore holes, they will give surface observers as clear a picture of it as if they were there.

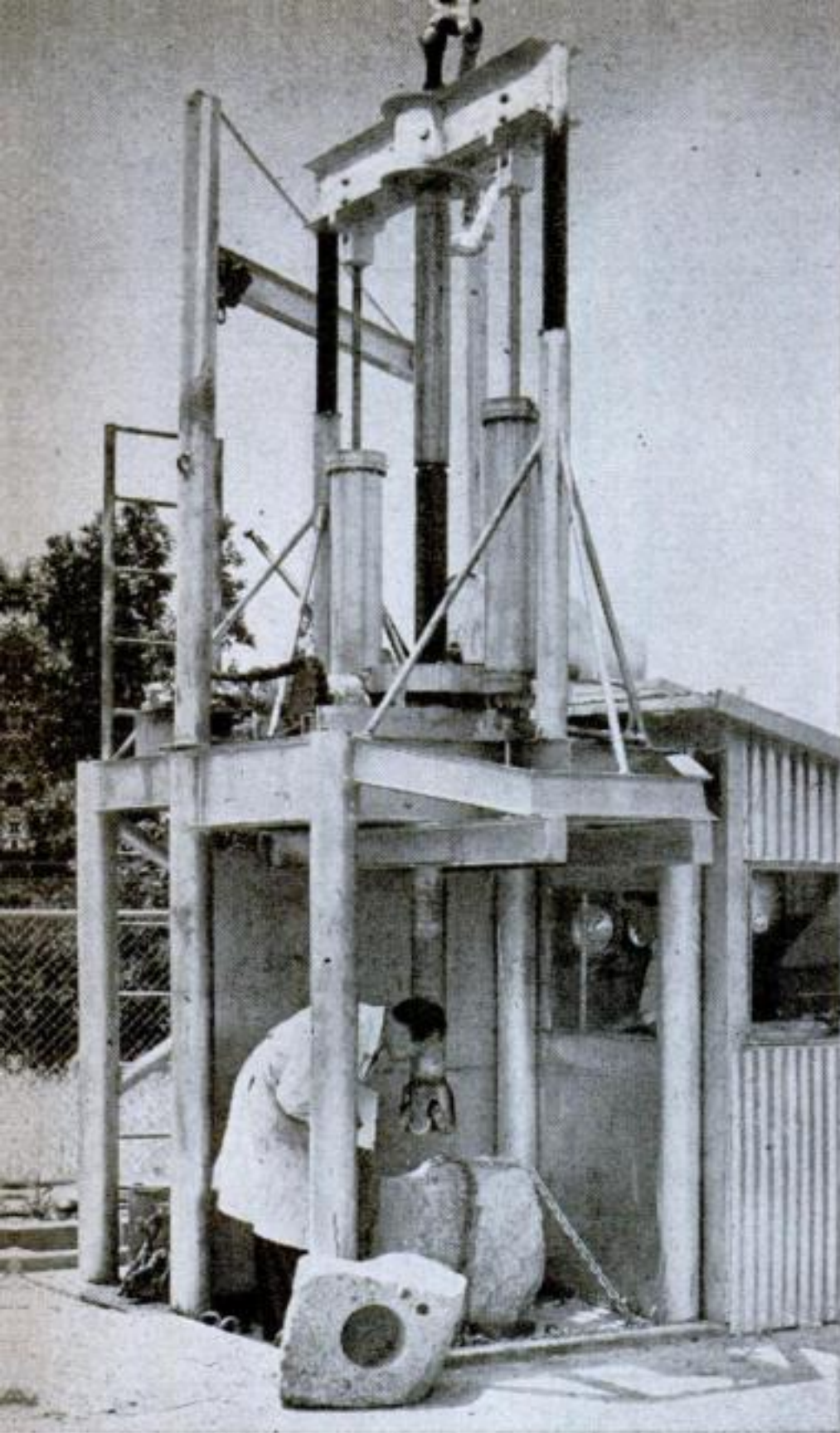
Drama and danger attend extremely deep drilling, still a new art and uncertain adventure. So far only two holes have passed the 17,000-foot mark. Standard of California abandoned Maxwell No. 1 near Ventura after losing tools at 17,696 feet. Superior Oil Company recently set the world's record of 17,823 feet—just past 3½ miles—with its Weller at Caddo, Okla.

Whether any hole approaching four-mile depth will yield enough oil to repay a \$750,000 investment no one knows. A



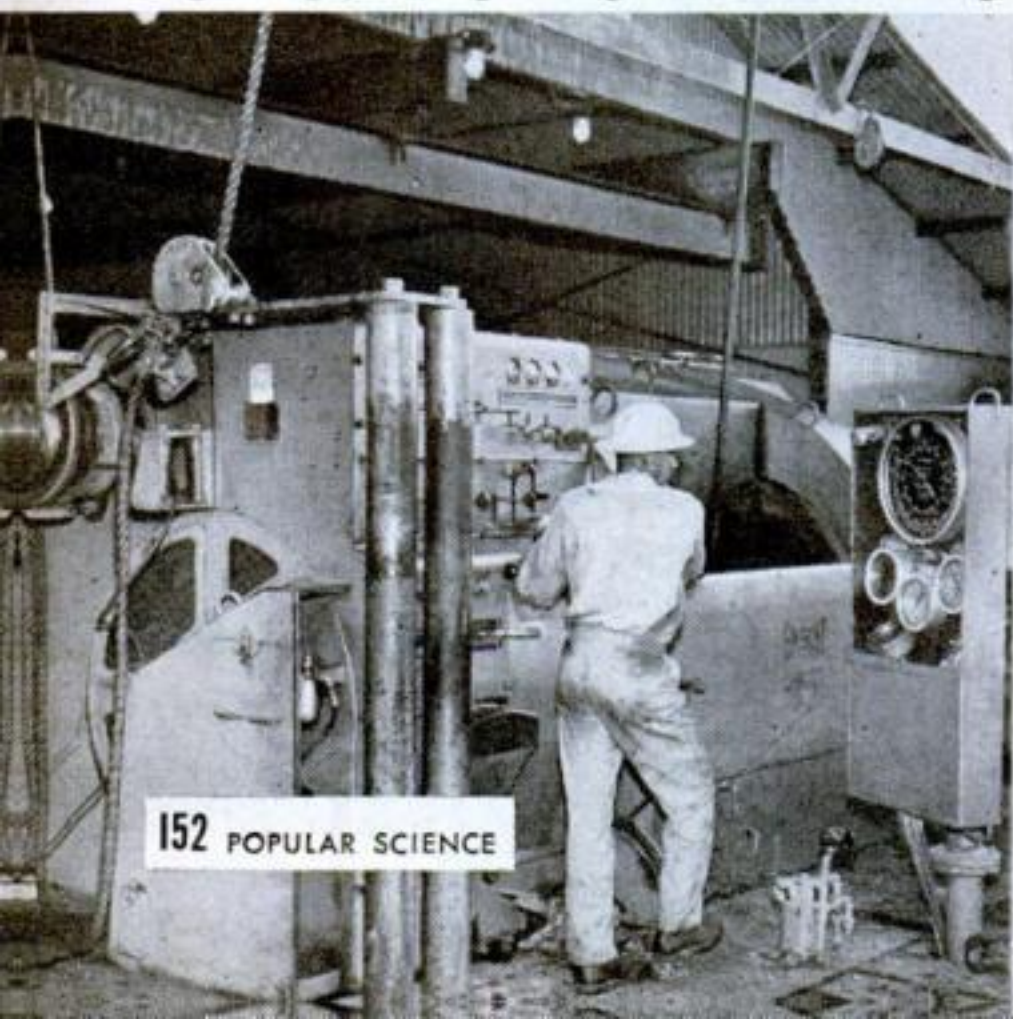
Gamma-ray logs in five adjacent wells yield wavy lines and interpretation shown vertically. "Lows" in curve (toward left) mark sandstone beds that may hold oil. "Highs" (toward right)

below, caused by radioactive shale, supply the needed clue to solve puzzle of rock movements in fault zone between wells C and D. In photo, moving chart registers findings of ray instrument.



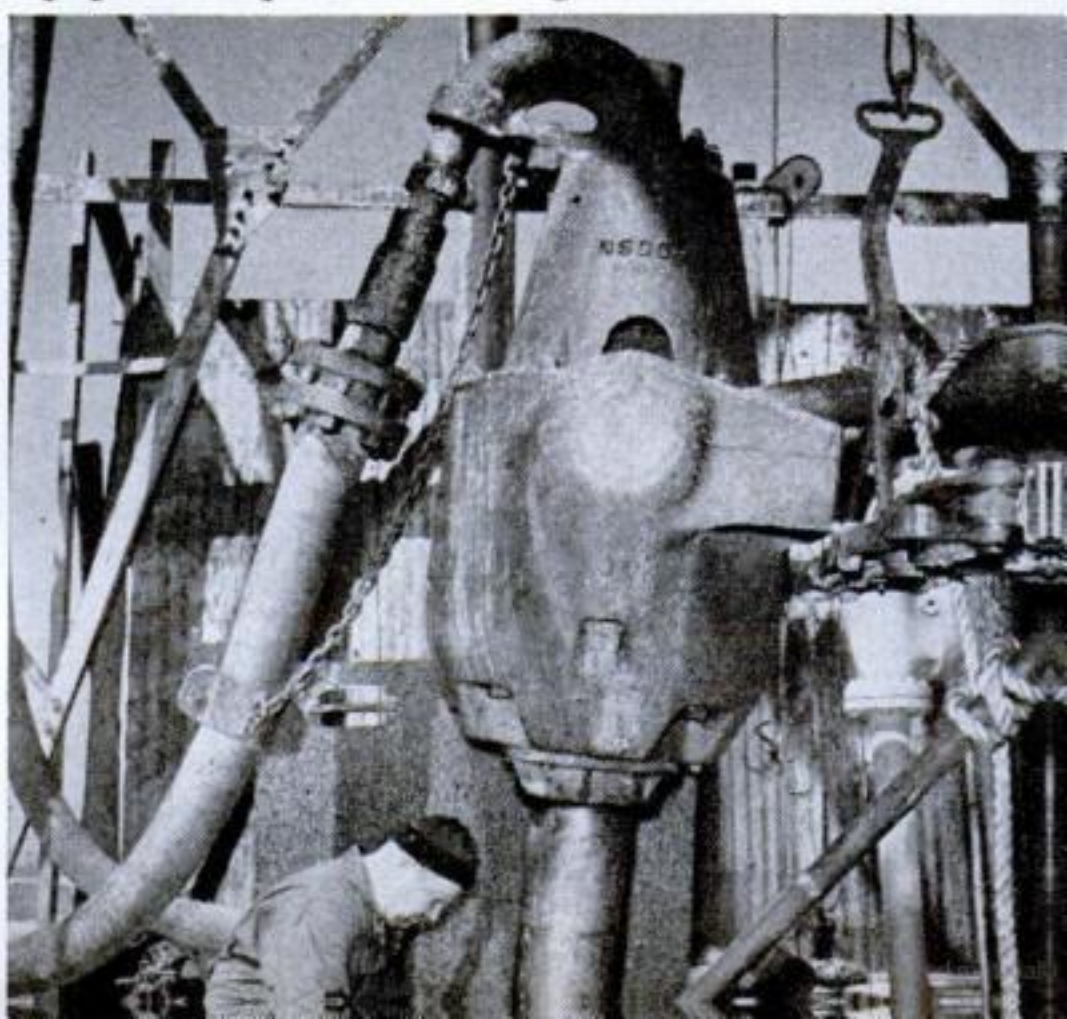
Bits of new design get test in this machine, where they bore through blocks of granite at 350 revolutions a minute under 30-ton load. Normal load on bit drilling well is four tons.

This mighty Emsco ® drawworks is designed to reach depths below 20,000 feet. Mounted with engines and 186-foot-high derrick on a huge barge, it is operating in Louisiana swamp.



Special mud for deep drilling is tailor-made by addition of Impermex ®, a pretreated starch. Heat-resisting mixture serves to wash up cuttings and keep underground water out of hole.

Giant Kelly swivel, through which mud flows into drill pipe under great pressure, is adjusted by a crewman. Device is typical of the massive equipment required for drilling four miles down.



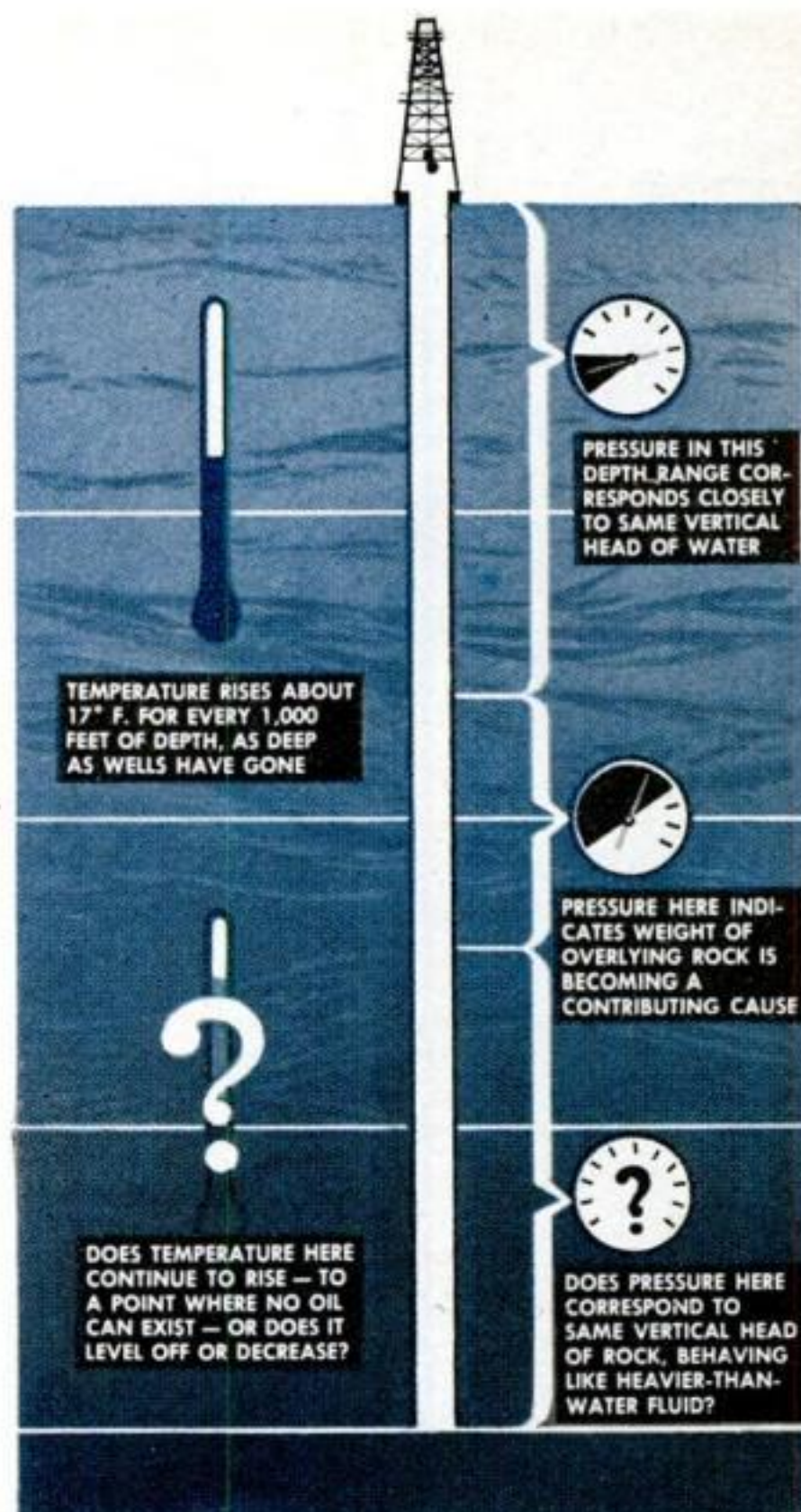
dozen companies are eager to find out. Some time during the next few months in Oklahoma, Wyoming, or California, excited shouts may ring out as a surface indicator shows that a bit scarcely larger than your fist has reached the 20,000-foot level for the first time.

Derrick and machinery must be able to handle the mighty load of its shaft and the great strings of casings that will line the hole, forming a four-mile "straw" to sip oil from the depths. The shaft alone is a 310,000-pound string of 3½-inch drill pipe that weighs as much as a locomotive. Lest drill pipe and casing pull apart of their own dead weight, special alloys will be needed, plus joints and collars of exceptional strength.

These mechanical problems have been solved, and three firms—Emsco, National Supply, and Oil Well Supply—have produced drilling rigs capable of new records. The drums of their powerful drawworks run long strings of drill pipe and casing up and down under steam, electric, or Diesel power at the touch of two buttons. Mounted on a huge barge, which was towed to the site and sunk there, one of the big Emsco rigs now is sinking a shaft for the Shell Oil Company in Iberia Parish, La. A 2,000-hp. steam engine, biggest ever to power oil-drilling equipment, handles pipe. Another of equal power spins a rotary table that turns the bit like a carpenter's brace. Using a 186-foot derrick, the rig is so big that driller, derrick man, and fireman talk over an intercom system (PS, Sept. '48, p. 97).

Nature offers deep drillers more problems. Temperature rises about 17° F. for every 1,000 feet of depth, after the first few hundred feet. One thing this will affect is the mud that drillers circulate down the drill pipe and back up around it, to wash up rock cuttings, keep out other fluids during drilling, and plaster the wall of the hole. In a 20,000-footer, pumps will circulate 84,000 gallons or about 60 tons of mud. Its round trip to the bottom and up will take four hours. At deep-level heat of hundreds of degrees, ordinary clay-and-water mud would bake dry and clog the well, so special noncaking mud containing corn starch will be used. Hundreds of tons of ice may also be dumped into it—as one California crew did to cool mud from 240 to 80 degrees before recirculation.

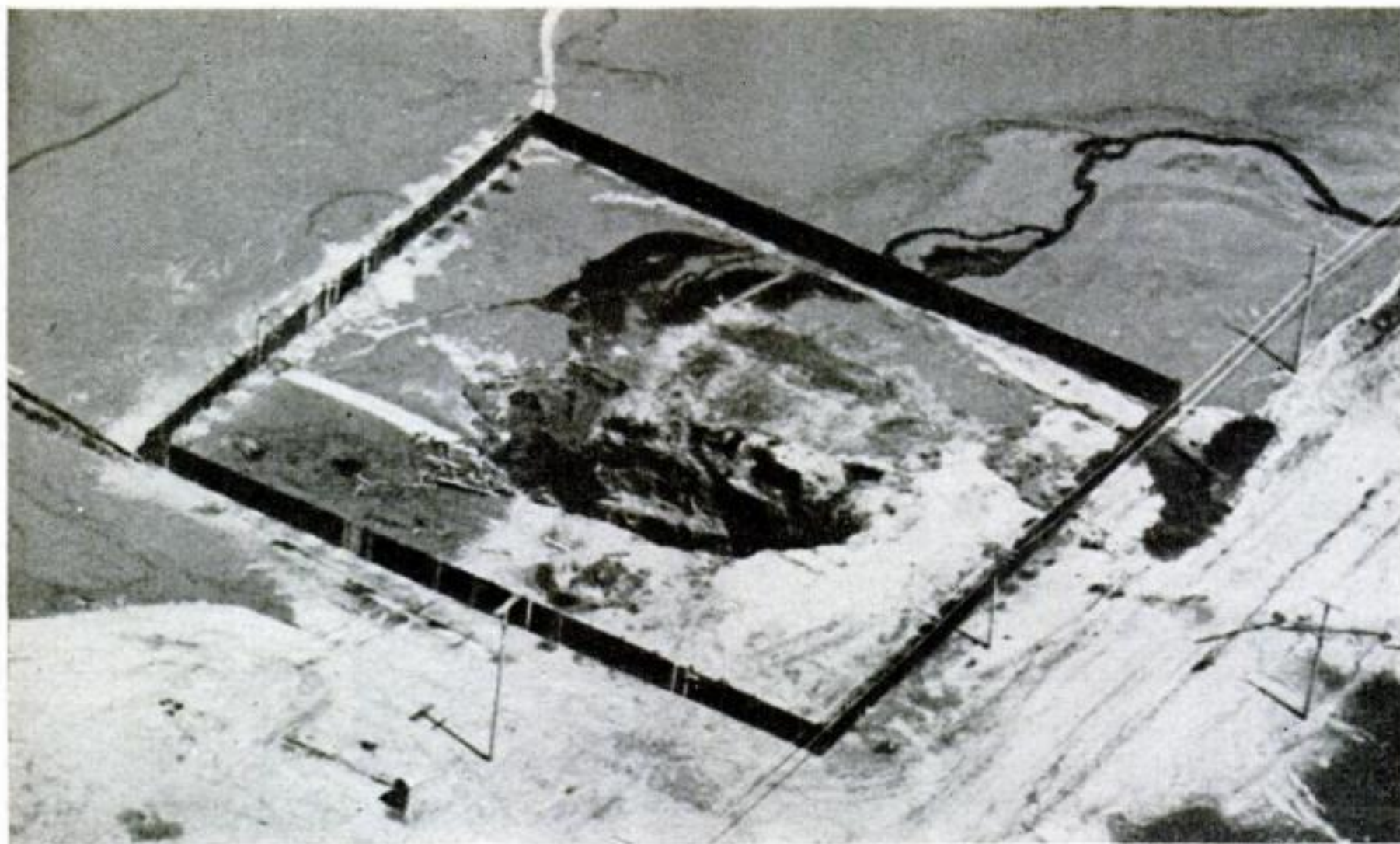
But rising temperature is a minor problem beside the hazard of puncturing the deepest gas and oil pockets. These natural



Mysteries of earth's interior will be solved by four-mile-deep shafts. Geologists will find whether temperature keeps going up, and pressure corresponds to "head" of fluid-like rock.

"bombshells" may be under such terrific pressure as 15,000 pounds to the square inch, enough to crush the most heavily armored deep-sea diving suit like an eggshell. That pressure must somehow be kept under control—or else. When the rig begins to quiver and dance, veterans of a deep-drilling crew know just what it means, and don't stick around to see what happens next. The man atop the derrick leaps for an escape seat, swung like a bosun's chair on a guy wire, and slides for his life. Up the hole comes a roaring jet of sand-laden super-pressure gas, a sandblast of awesome power. Gas "blowouts" have torn out craters big enough to swallow derrick and all!

Measurements show that underground pressure corresponds closely to the same



Here's what can happen when drillers prick a bubble of gas under fantastic pressure, miles below earth's surface. Blowout above was so terrific that it scooped out huge crater that

swallowed derrick, equipment, and all. An erupting jet of superpressure gas and mud acts like a titanic sandblast. By striking sparks, it may start destructive fire, adding to havoc.

vertical head of water for the first 8,000 to 12,000 feet. Then it rises more sharply, as if the rock itself is becoming plastic and beginning to "flow" under the great weight it supports. New shafts to 20,000 feet will show whether, as geologists suspect, pressure at extreme depths corresponds directly to a "head" of fluid with the density of rock. A shaft like those aimed at new levels measures 20 inches in diameter near the surface and tapers to six inches below 15,000 feet. Rather than interrupt the drilling and bring up a "core" or rock sample every few feet, oil men depend mainly on cuttings and traces of oil washed up with the mud for clues to what the bit is going through. Then a "log" or survey with remote-indicating instruments tells the rest.

Oil is indicated most directly by an "electrical log," using three electrodes lowered into the hole. One sends electric current from the bottom to the surface; the other two, a few feet apart vertically, explore the wall and measure its electrical resistance. Porous sandstone containing oil has more resistance than barren sandstone, which in turn has more than nonporous and nonoil-bearing shale.

Now the "radioactivity log," a new triumph of atomic science, enters the scene.

Supplementing an electrical log, it gives the best picture ever obtained of the vertical lay of the land. Used alone, it permits surveys in wells already cased and where other conditions preclude electrical logging.

Shaped like a torpedo, the device employed is the invention of Wells Surveys, Inc., Tulsa, Okla. Lowered on a cable, it usually makes two round trips to the bottom. On one trip it measures the natural radioactivity of the rock, which varies according to the type of mineral. Faint but detectable, this is due to minute traces of radium or other radioactive elements. Penetrating gamma rays, picked up by a ray-detecting ionization chamber, register up above ground as pen squiggles on a moving paper chart.

For its second trip the torpedolike device becomes a "ray gun" and carries, besides the ray detector, a source of the extremely penetrating particles called neutrons. While this source is a trade secret, a suitable one that emits a steady stream of neutrons would be a mixture of beryllium-metal filings and radioactive radon gas.

Many elements have the power of capturing neutrons, emitting gamma rays in the process. Thus neutrons striking surrounding rock induce "secondary" gamma rays that register on the ray detector so strongly that

weak natural rays do not interfere. The induced rays fall off if rocks are shielded by substances rich in hydrogen, which slows down neutrons. This happens when rocks contain water, which is largely hydrogen, or oil and gas, hydrogen-rich like all hydrocarbons.

Broadly speaking, low readings in the gamma-ray or natural-radioactivity survey indicate likely levels for oil, and low readings in the neutron survey indicate a fluid that may be oil. To a layman this might seem inconclusive, and so it would be if the surveys revealed no more. Actually every fluctuation in the intricate curves has a meaning to experts. It may mark a boundary between layers of shale, sandstone or limestone, granite or volcanic ash, and other important formations.

Beds of highly radioactive shale, for example, contain no oil. But they give such exceptionally clear-cut records of their levels on the gamma-ray chart that they serve oil men as invaluable signposts to the whole geology of a region. Thus the ray surveys, with other data, tell the complete story of what's beneath the earth.

Tapping the Underground Oil

The pay-off comes when drillers, having sunk a well and lined it, apply this knowledge to perforate the casing at just the right level or levels to tap the oil. Artillery developed especially for this purpose includes cylindrical "guns," lowered on a measured cable, that fire bullets through the steel-and-cement wall into the formation.

The latest innovation in underground ordnance is the "shaped charge." This sensational World War II invention, which enabled one soldier with a bazooka to blast a tank's tough armor, now is finding its first peacetime application. When the cone-shaped pack of high explosive detonates within an oil well, its terrific shock wave punches a funnel for the gushing oil.

New ways to reach and tap hitherto inaccessible oil pools banish all fear, experts say, of exhausting our oil reserves in the immediately foreseeable future. Total proved reserves at the end of 1947 stood at an all-time high—enough to last 12 years if no more were discovered—and oil is actually being found faster than it is being consumed. Last year, twice as much new oil was discovered as was used up. And now, wherever geologists find oil, latest methods promise that drillers can get it. **END**

"SHAPED CHARGE" OF WORLD WAR II NOW AIDS OIL SEEKERS

THIS IS WHAT THE CONE-SHAPED CHARGE LOOKS LIKE IN CROSS SECTION



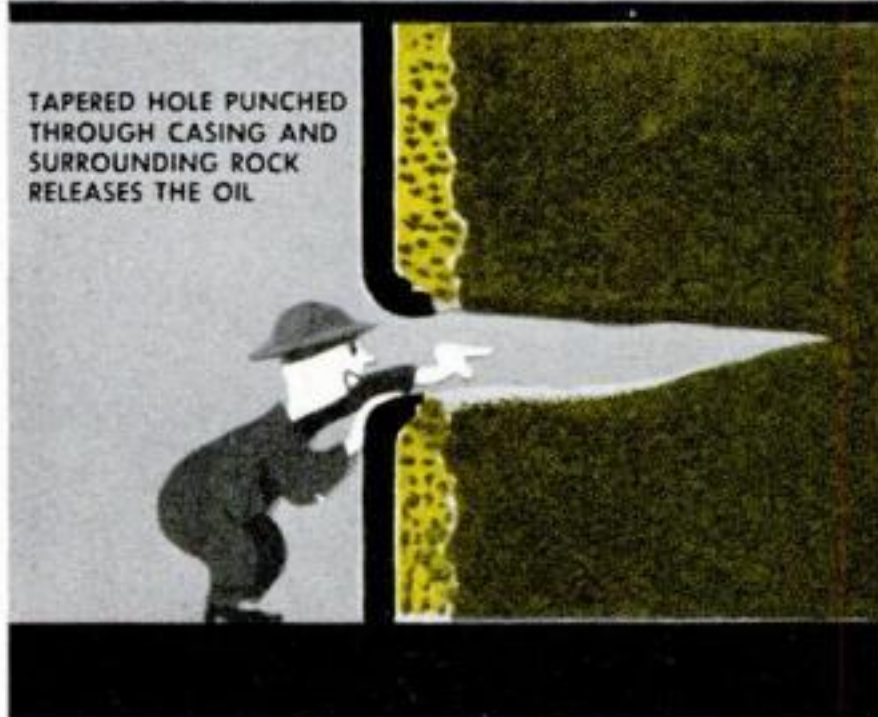
DETONATED ELECTRICALLY, IT HURLS FORWARD A FOCUSED JET OF HIGH-VELOCITY PARTICLES



AS THE WAVE FRONT OF THE BLAST ADVANCES, MORE OF THE CONE IS FOCUSED INTO THE JET



TAPERED HOLE PUNCHED THROUGH CASING AND SURROUNDING ROCK RELEASES THE OIL

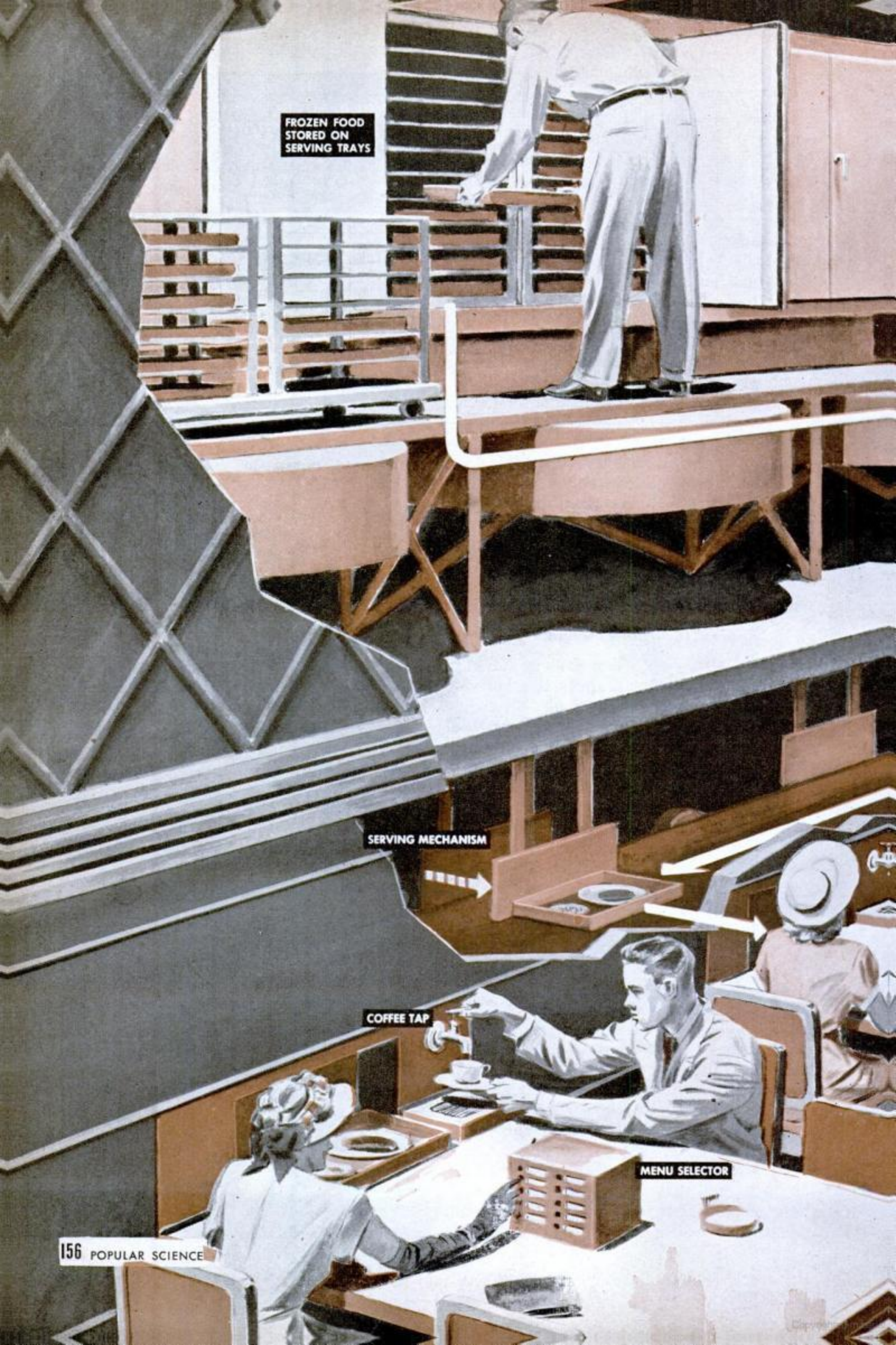


FROZEN FOOD
STORED ON
SERVING TRAYS

SERVING MECHANISM

COFFEE TAP

MENU SELECTOR





Will Restaurants Be Built This Way?

YOU can't have dinner tonight in this push-button cafe—but maybe you will some day in the future.

The cutaway drawing, not quite as fanciful as it looks, shows how an ingenious designer might team up tested tricks of mechanics and electronics in an automatic restaurant that would serve complete meals, piping hot, in less time than it often takes to catch a busy waiter's eye.

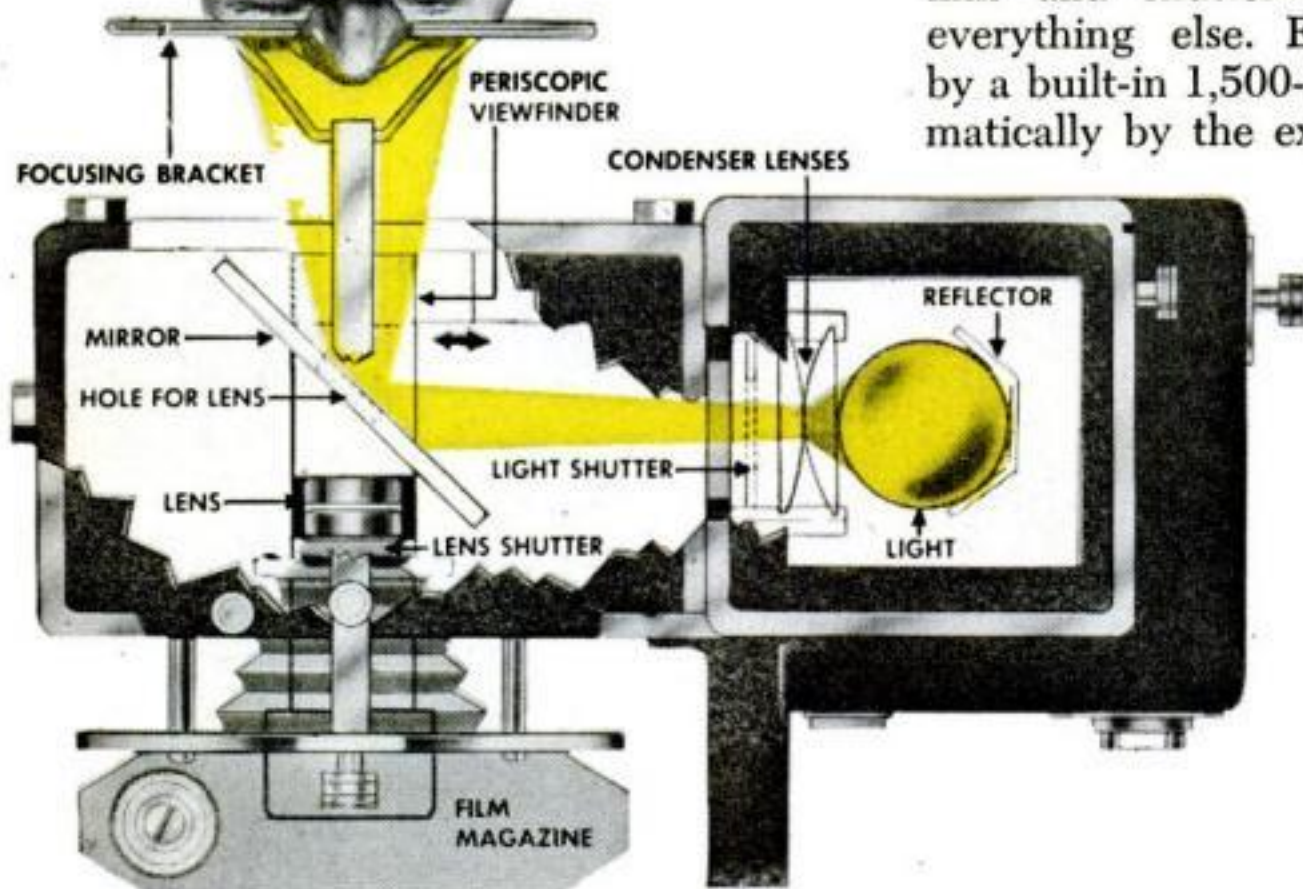
Individual portions of quick-frozen fresh food, or dishes cooked in advance and then quickly frozen to preserve their flavor, would be stored on plastic plates in deep-freeze

compartments. You would punch an automatic menu selector at your table. One or more trays with your order would thereupon be carried on conveyer belts, first to an electronic oven and then to your table.

Cooking, or reheating of precooked dishes, would be done by high-frequency radio waves, like those used by radar. These waves, by stirring up the molecules in the food itself, generate an intense heat all the way through it—instead of just on the outside. Electronic cookers now in use can broil a steak in 45 seconds and bake a potato in two minutes.

Doctors' Camera Catches Symptoms

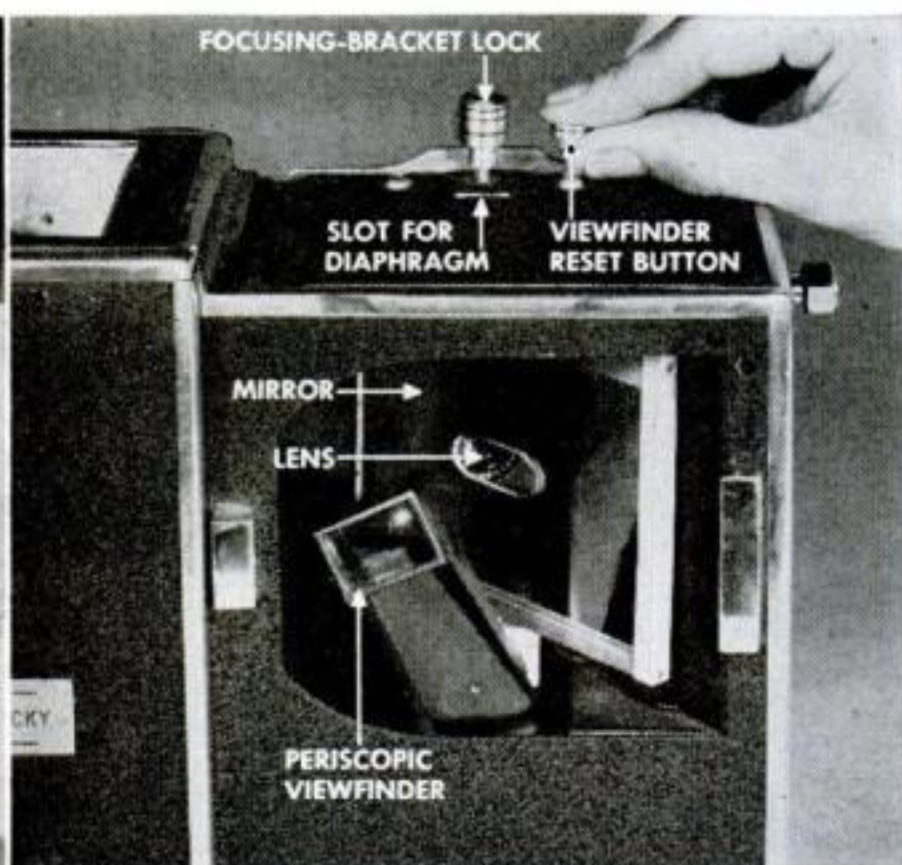
THE exacting, full-color photos needed by medical scientists can be made more easily than a brownie snap of the kids at the beach with a completely automatic camera designed by Coreco Research Corp. The doctor need only press two buttons and wind film and shutter—the camera itself does everything else. Even lighting is provided by a built-in 1,500-watt bulb operated automatically by the exposure button.



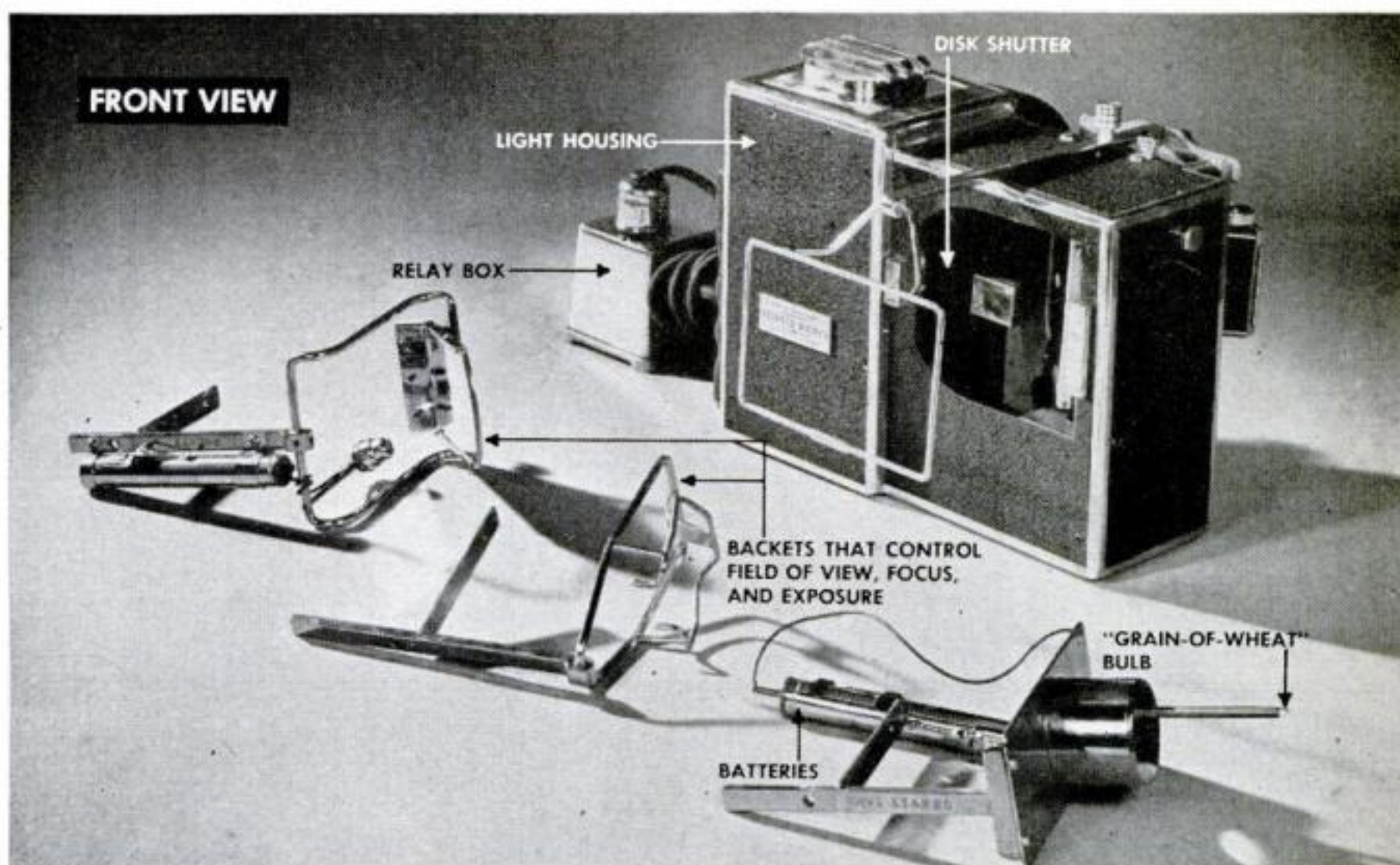
Sketch shows how built-in lamp illuminates patient's eyes uniformly. Mirror in front of lens reflects light on to eyes when movie-type, one-speed disk shutter opens for exposure. Lens shooting through hole in mirror has own one-speed shutter to keep room light from fogging film. It opens just before light shutter. Bracket touching patient sets focus.



Automatic focus and exposure control is given by series of brackets designed to be held next to part of body being photographed. Since the bracket sets distance from patient to lens and light, it determines what focus and exposure are needed. Length of horizontal arm of bracket sets back of camera proper distance from lens. Diaphragm hole in vertical arm of bracket,

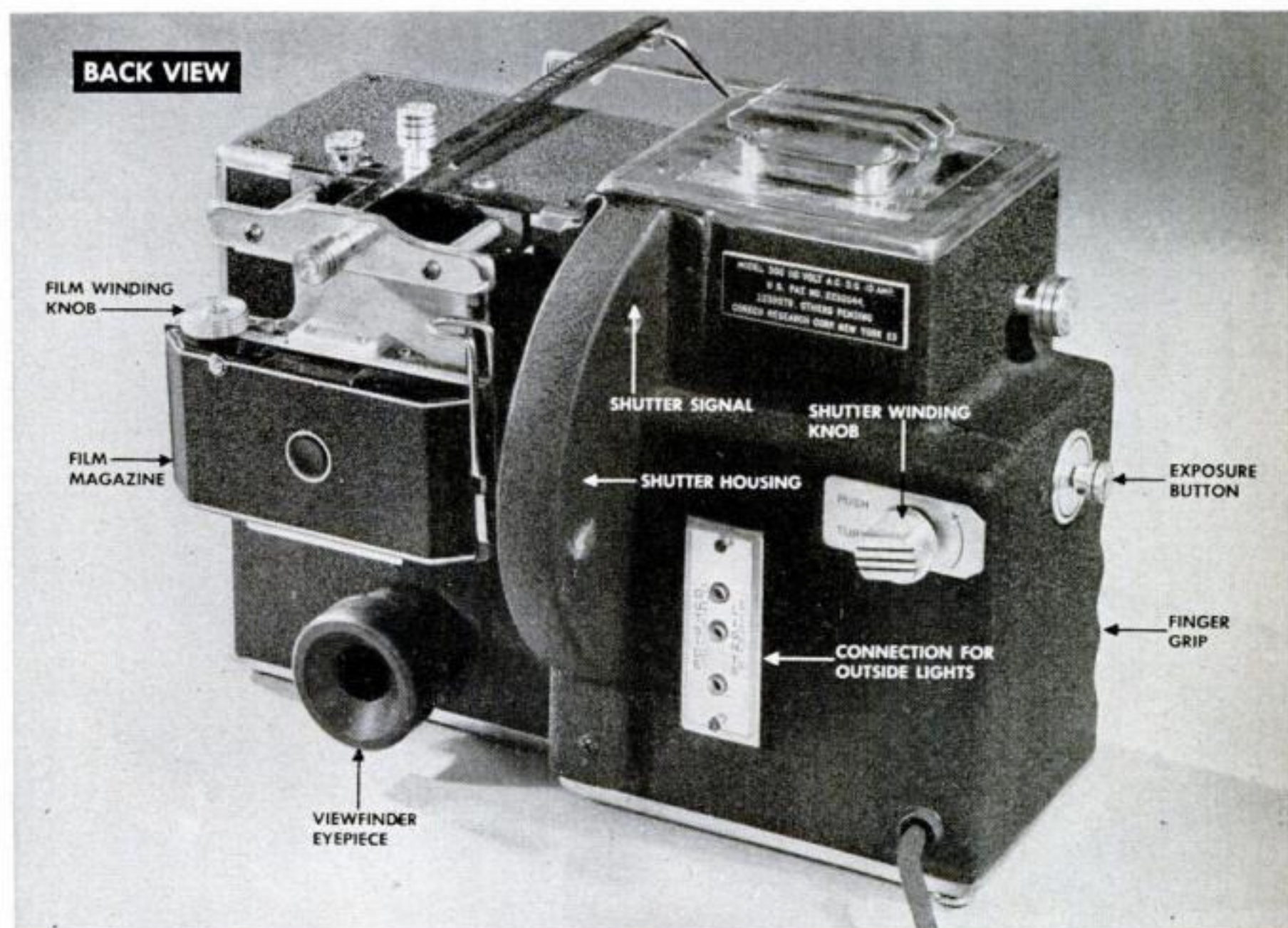


which slides down between lens elements (see photo above, left), sets correct lens opening. Brackets frame picture area, but optical viewfinder is also furnished—a periscope that fits just in front of lens, eliminating parallax. It automatically swings out of way before the shutter opens, as shown in photo at right above. After exposure, it is reset by push button at top.



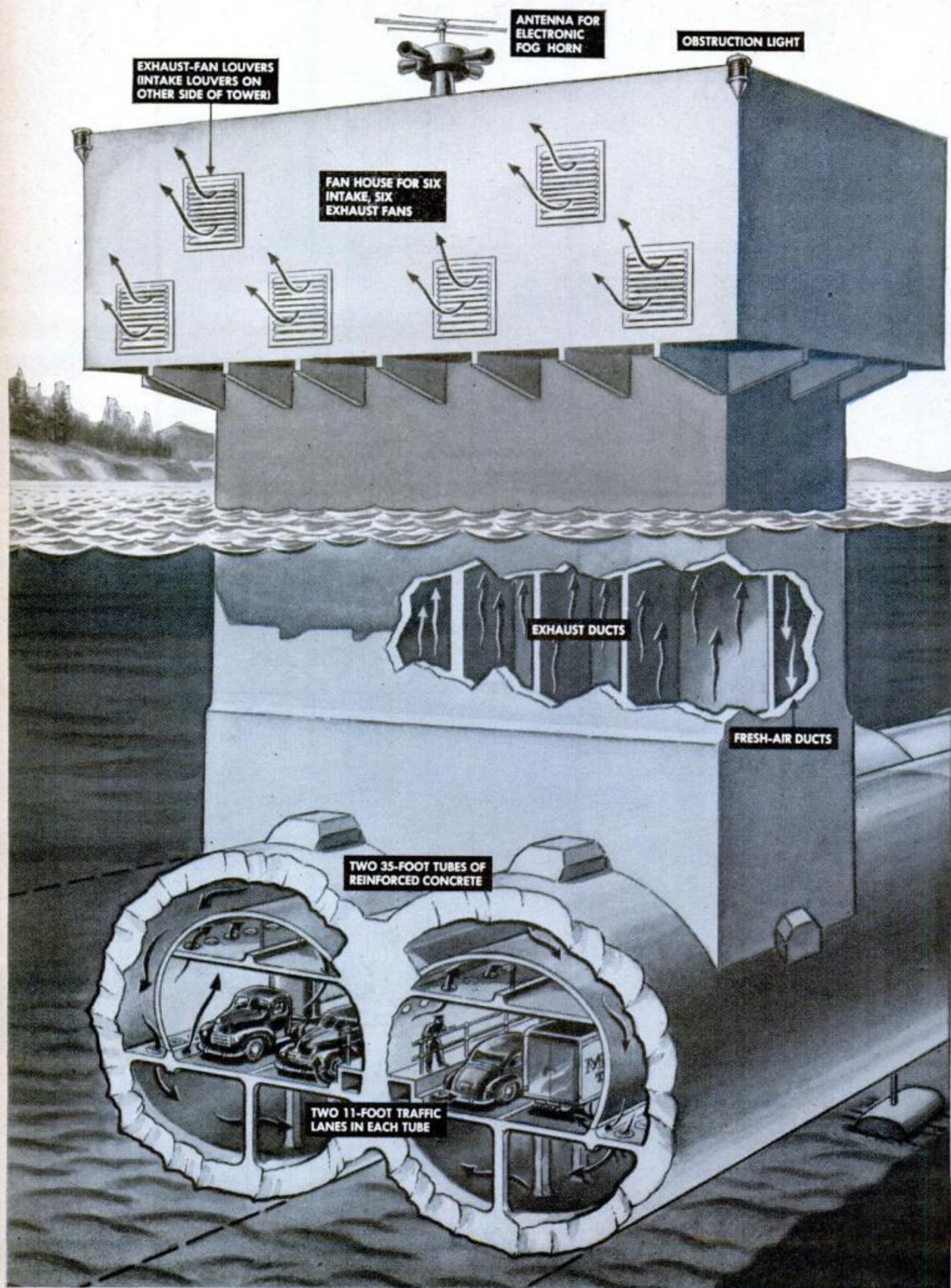
Set of focusing brackets—each designed for particular part of body, such as eye, teeth, etc.—are major foolproof feature in Coreco[®] camera. But equally important in making every shot

perfect is special built-in light. It operates at rigidly controlled color and is wired through relay that delays action of its special shutter until bulb has warmed up to correct color.



About the same in size and weight as a Speed Graphic[®], the doctors' camera is intended for use without a tripod—notice the far right edge shaped to fit the hand. In use it is rested against

the patient, so that movement during an exposure is unlikely. For photographing large areas, socket in back connects outside lights and automatically cuts off built-in bulb.



Roadway to Float Under Water

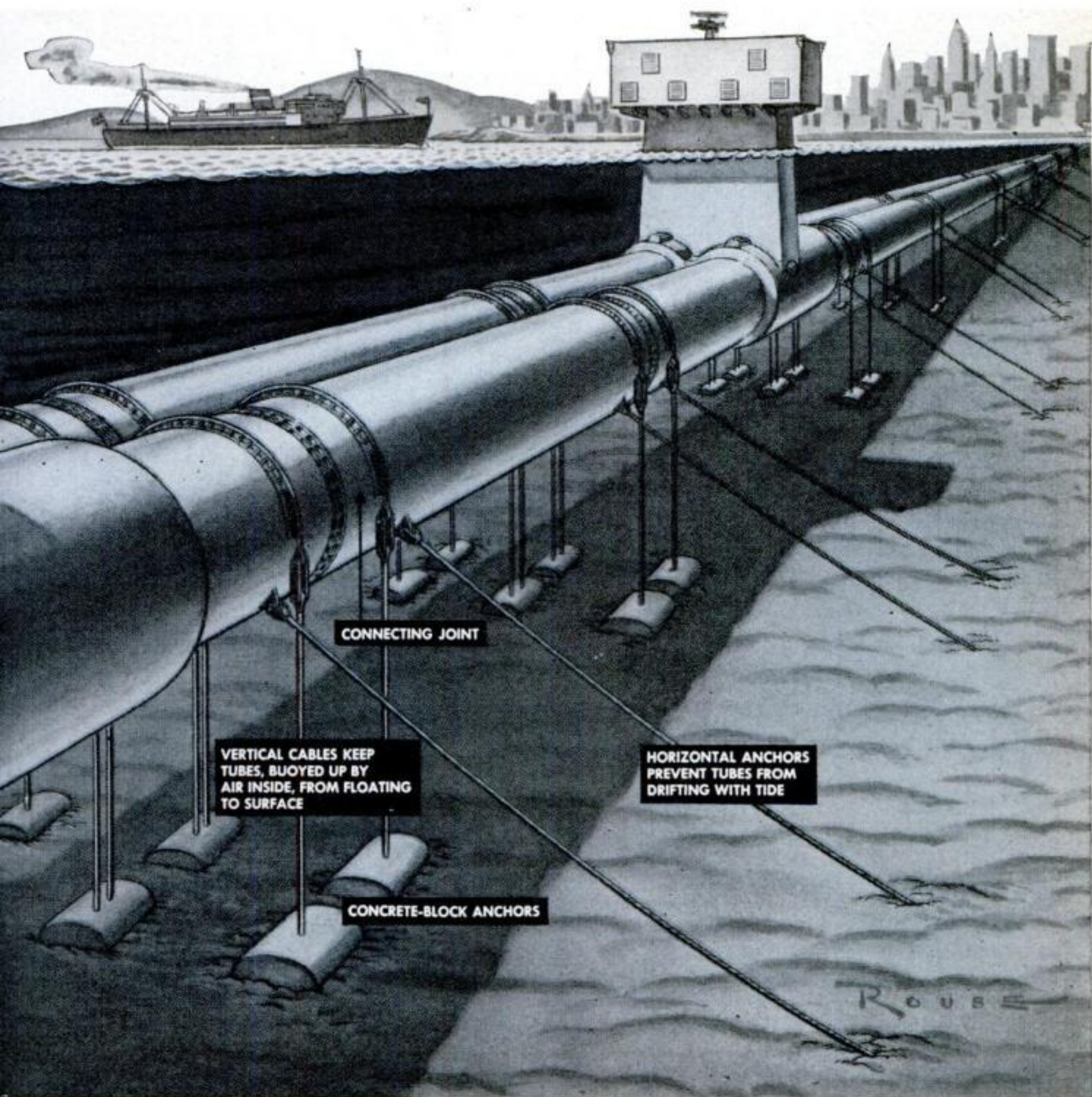
Proposed tubes 2½ miles long would carry traffic 50 feet below surface.

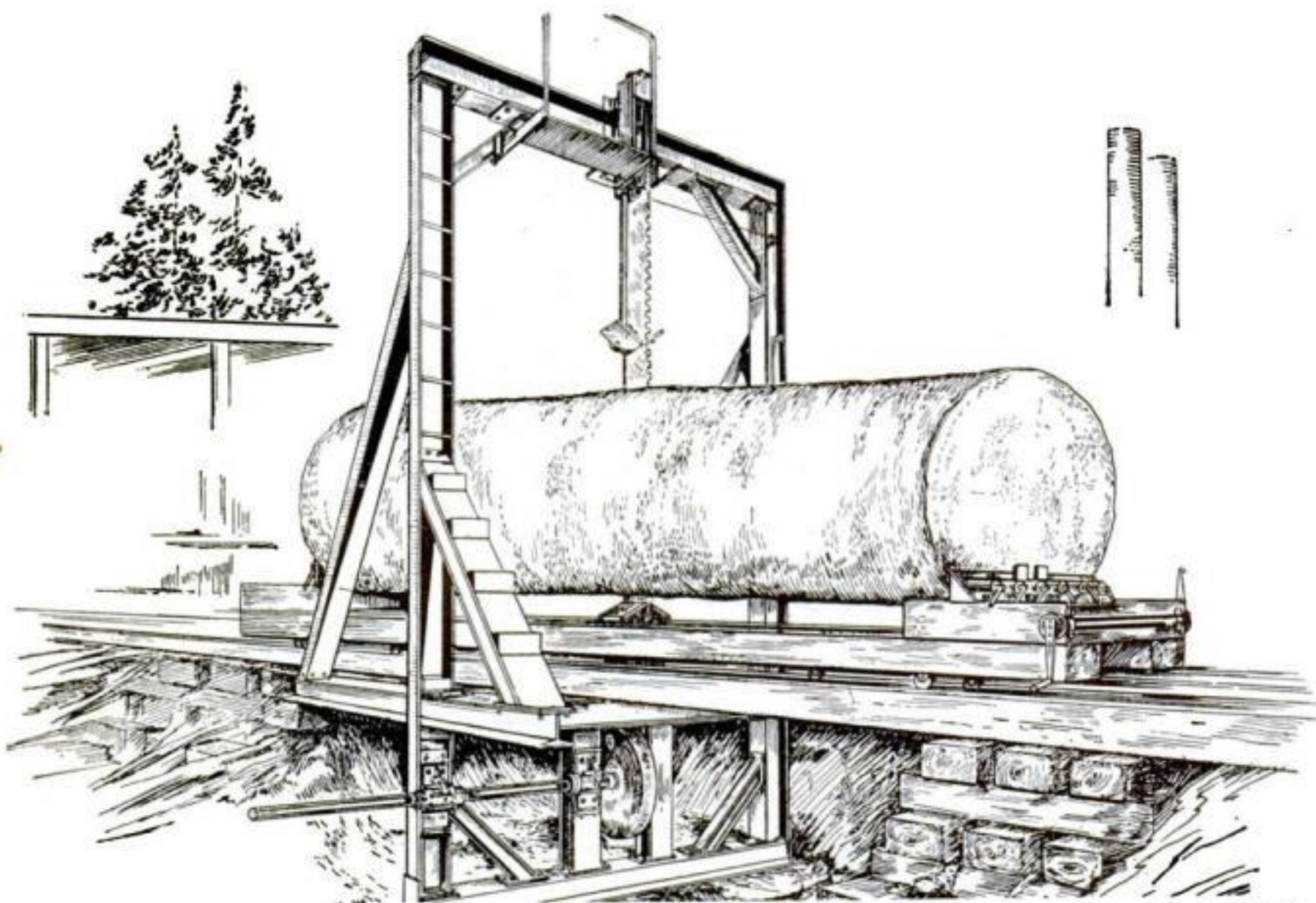
BETWEEN Seattle and Bremerton, Wash., lies an arm of Puget Sound—too wide for a suspension bridge, too deep for a tunnel, swept by tides too high for a floating causeway. Problem: how to build two four-lane highways across that 2½-mile stretch of water. This drawing, based on official

blueprints, shows the proposed solution.

Two sets of these twin tubes would float 50 feet below the surface at low tide, so as not to block shipping. Motor fumes would be blown out and fresh air sucked in through towers rising above waves and spray.

Plans for the \$50,000,000 project, drawn by Charles E. Andrew, of the Washington Toll Bridge Authority, are now awaiting approval by the state legislature.





Saw Tackles Big Timber

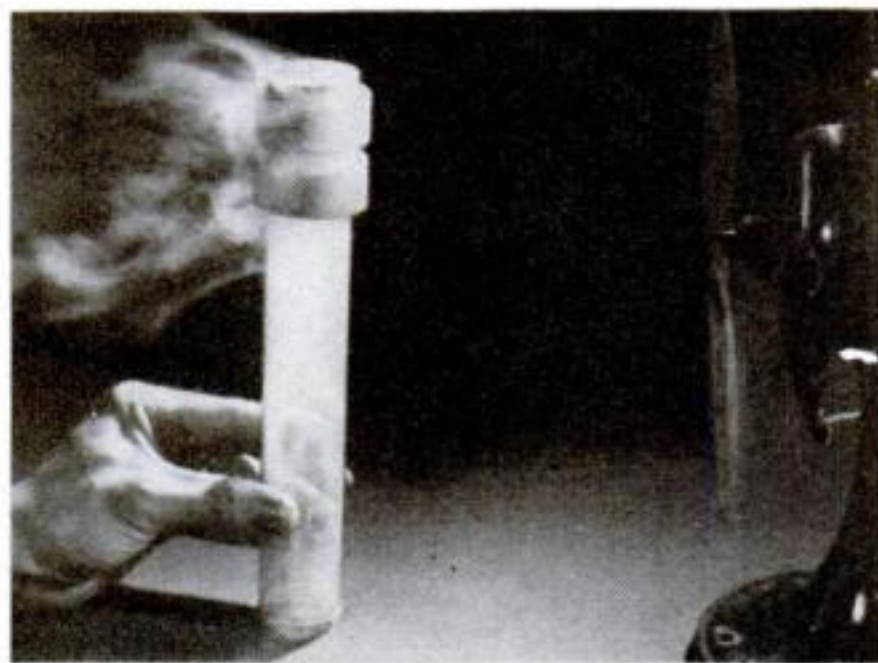
Logs too big for ordinary saws get a quick quartering in this new Triad[®] timber slicer. Reduced into four wedge-shaped sections, the oversized logs are ready for veneering or sawing into lumber. The ma-

chine stands 18 ft. high, and its 12-ft. blade has a vertical stroke of 20 in. A carriage riding 60 ft. of rails can handle a log 25 ft. long. Moving two feet a minute, a log this size can be quartered in less than an hour. The log splitter is made by the Northwest Machine Works, of Portland, Ore.



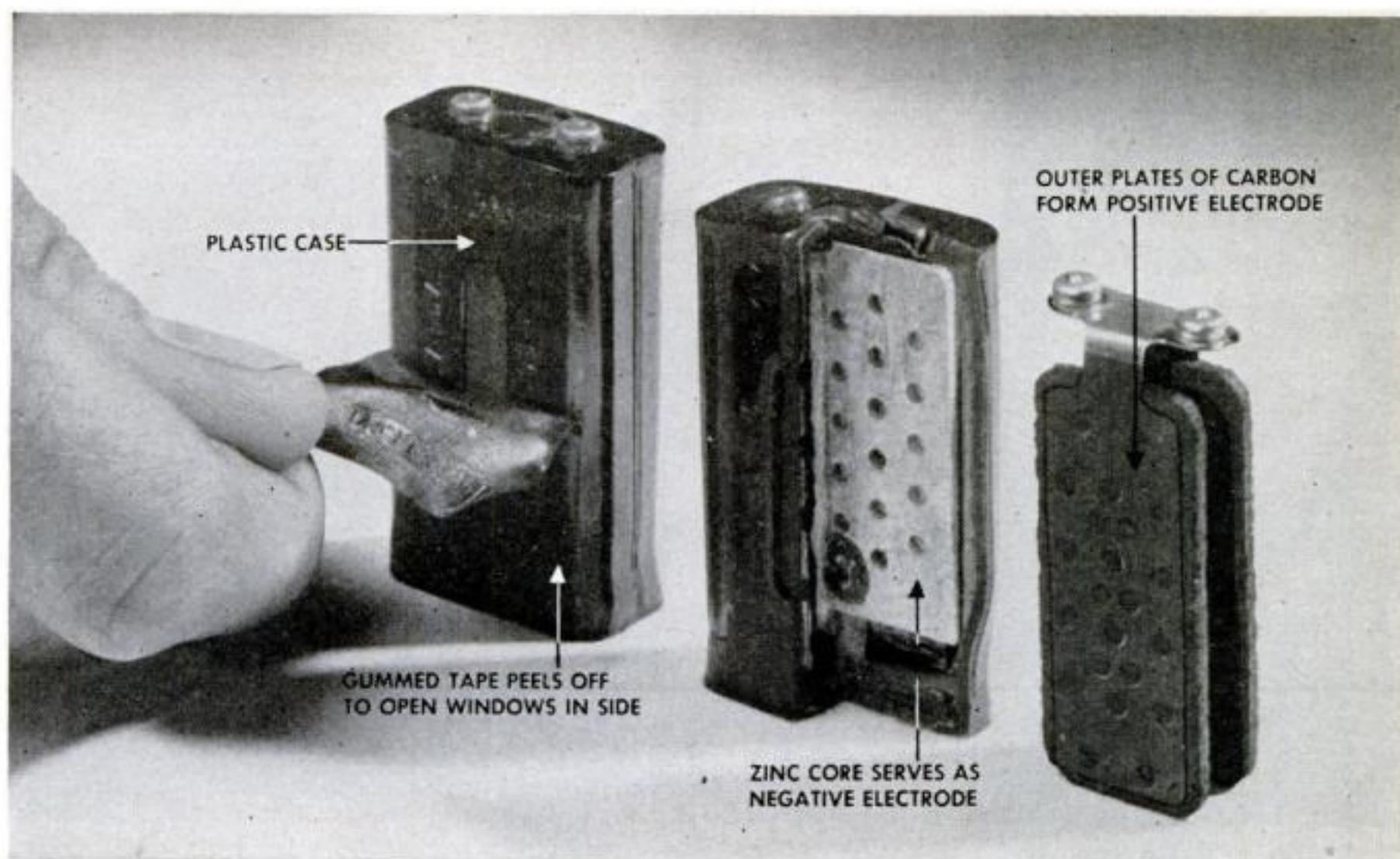
Aids Paralyzed Muscles

THE paralyzed leg muscles of this little girl are being exercised by an electric current. Stimulation keeps muscles from wasting away after attacks by such diseases as polio. Recently introduced by General Electric, the machine alternately contracts and relaxes paralyzed muscles 24 times a minute without effort on the part of the patient.



Chimney Puffs Smoke

TOPPING a transparent tube filled with cigarette smoke, this plastic model of a new chimney crown shows how it works. Twin rings make it windproof, and use air currents from any angle to create suction that pulls gases out of the chimney. Made by the Coleman Company, of Wichita, Kansas, the device also prevents downdrafts.



Reversed position of electrodes in new dry cell lets carbon plates breathe through holes in case.

Cell is 1.1 in. wide, .5 in. thick, 1.9 in. high. It powers 1¼-volt hearing-aid tubes.

Inside-Out Battery

A NEW kind of dry cell, going on the market next month, has three to four times the life of others its size. Those added hours of service come from its being made—literally—inside out.

Developed by the National Carbon Co., the revolutionary one-cell Eveready No. 1005-E is to be sold at first only for electrical hearing aids, but its design may be adapted to scores of other uses in the future.

The new "A" battery, like other dry cells, needs oxygen to neutralize the hydrogen that otherwise would collect on its carbon electrode and choke off the flow of current. But unlike others, in which half the space between a zinc case and carbon core is taken up by oxygen-liberating manganese dioxide, this one draws its oxygen from the air. Thus it can get along without the manganese dioxide—and has more room for active, electricity-generating chemicals.

What lets the mighty midget breathe air is its inside-out construction. Instead of zinc on the outside and a rod of carbon up the middle, it has a zinc core between two plates of porous carbon. These are placed



New midget, at right, not only outlasts standard hearing-aid battery, shown with it, but delivers steadier flow of power. Bigger models are planned for flashlights, portable radios.

in front of windows that are opened in the sides of the cell's plastic case by simply peeling off sheets of adhesive tape when you are ready to start using it.

The new cell was three years in development at National Carbon's research laboratories in Cleveland. Its principle has been used with moderate success in bigger batteries for railway signals and telephone equipment, but this is the first time it has been applied to small portable cells. The company regards the result as the most important development in the field of dry batteries in 60 years.



Mrs. Maria Witteveen, of Netherlands delegation to UN, talks to her nephew in Europe over

one of K2UN's custom-built 1,000-watt transmitters. Modern "shack" is at Lake Success.

Hams Around World Help United Nations

K2UN calling CQ. This is K2UN, the amateur station at United Nations headquarters in Lake Success, New York, standing by. Come in please."

This call has been answered by Lieut. Gen. Curtis LeMay over his ham rig in Occupied Germany, and by scores of other hams—in the United States, Russia, and other lands. A few of them are pictured here. K2UN is operated by volunteers, who

call other hams by their first names and gabble with them endlessly.

Several times the amateurs have leaped to the UN's aid. During the Palestine crisis, for example, 15 American hams volunteered to serve with the UN communications staff there. And once when the Rhodes station could not "raise" Jerusalem, official UN messages were relayed by Stanley Wolff of W2HIQ in Armonk, N. Y.

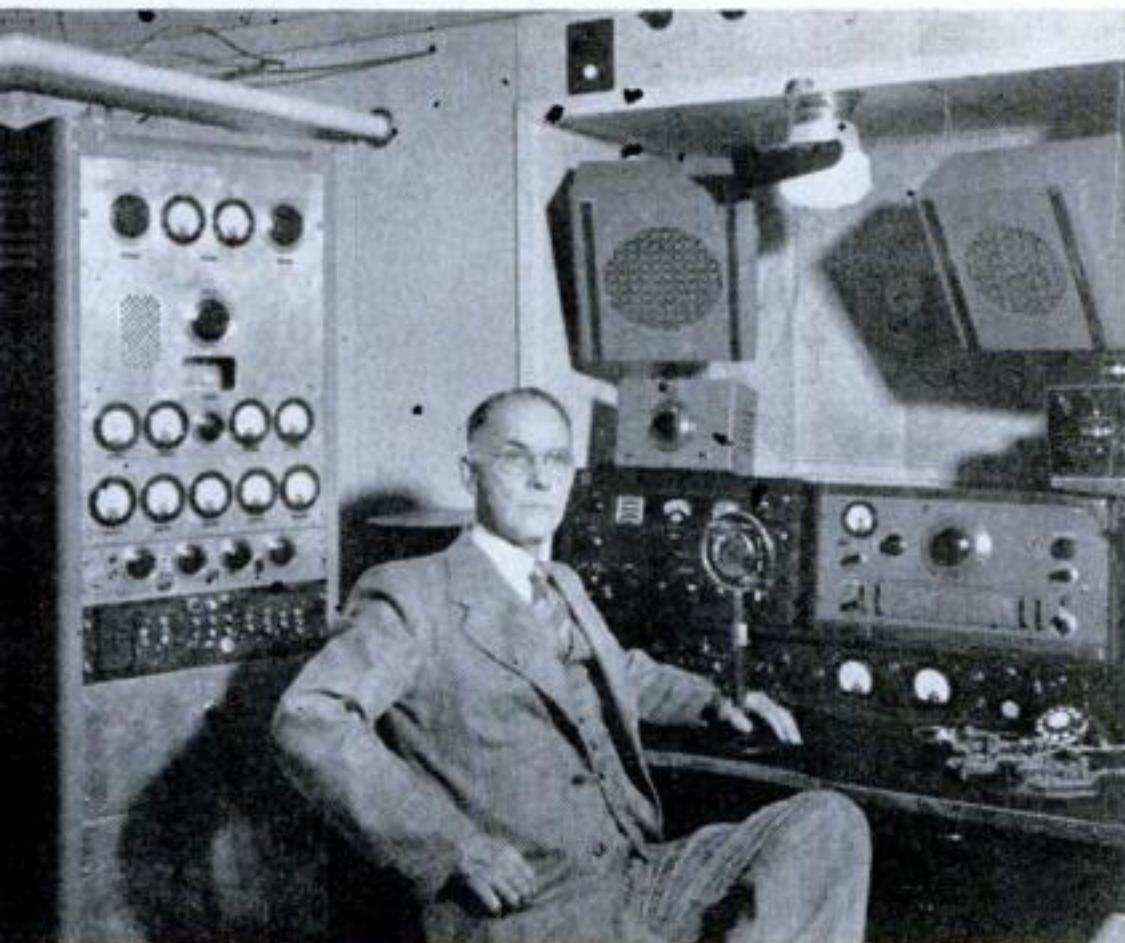
COSTA RICA. Otto Andre, who was the first ham in Latin America to become a member of the DX Century Club and has talked to amateurs in 175 foreign countries, used the rig shown in the

photograph at left below to make contact with K2UN. Photo at right shows his three-element, rotary-beam antenna and the house in Coronado in which his station, TI2-0A, is located.



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CANADA. F. F. Griffin, of VE4KF in Winnipeg, spoke to K2UN from this set. The transmitter, using a pair of 813's in the final stage, running 400 watts input, is remotely controlled.



FRANCE. Yves Naintre, of F8LX in Paris, made his transmitter from a surplus Collins AN/-ART/13 (just behind his right hand in photo above). He has been an amateur since 1925.



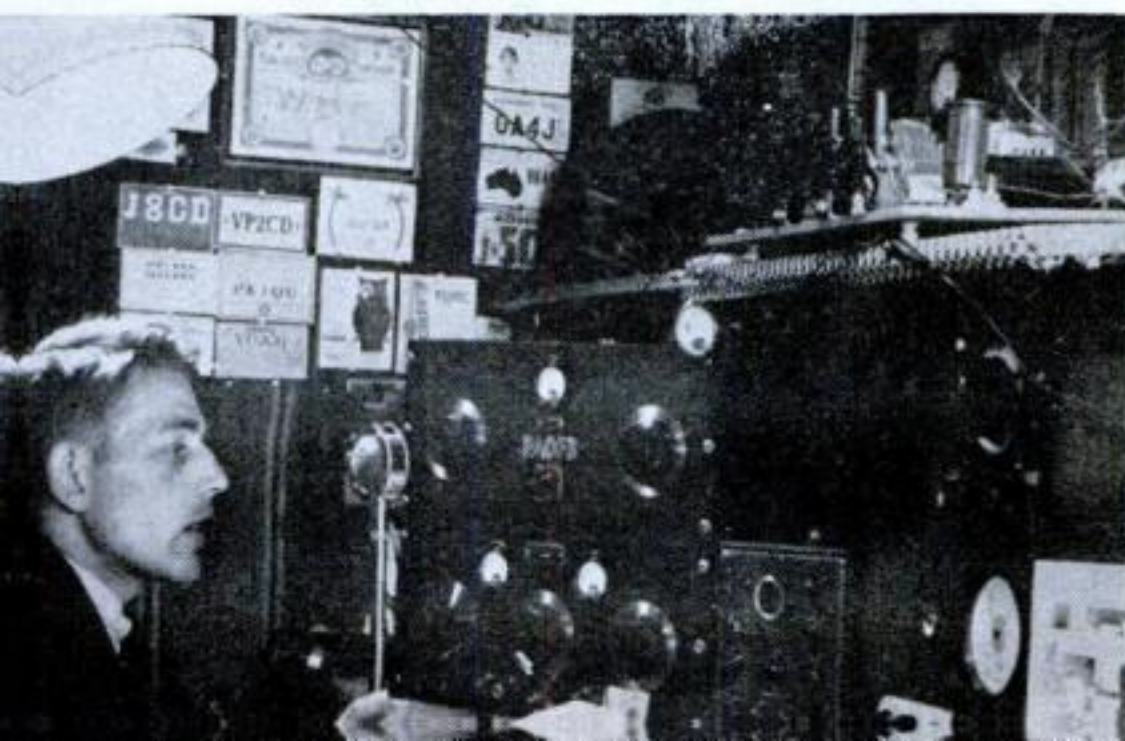
ITALY. The first amateur radio operator to make official contact with K2UN was Victor E. Motto, of Como, shown above at the equipment he used. Mr. Motto's call letters are IIRM.



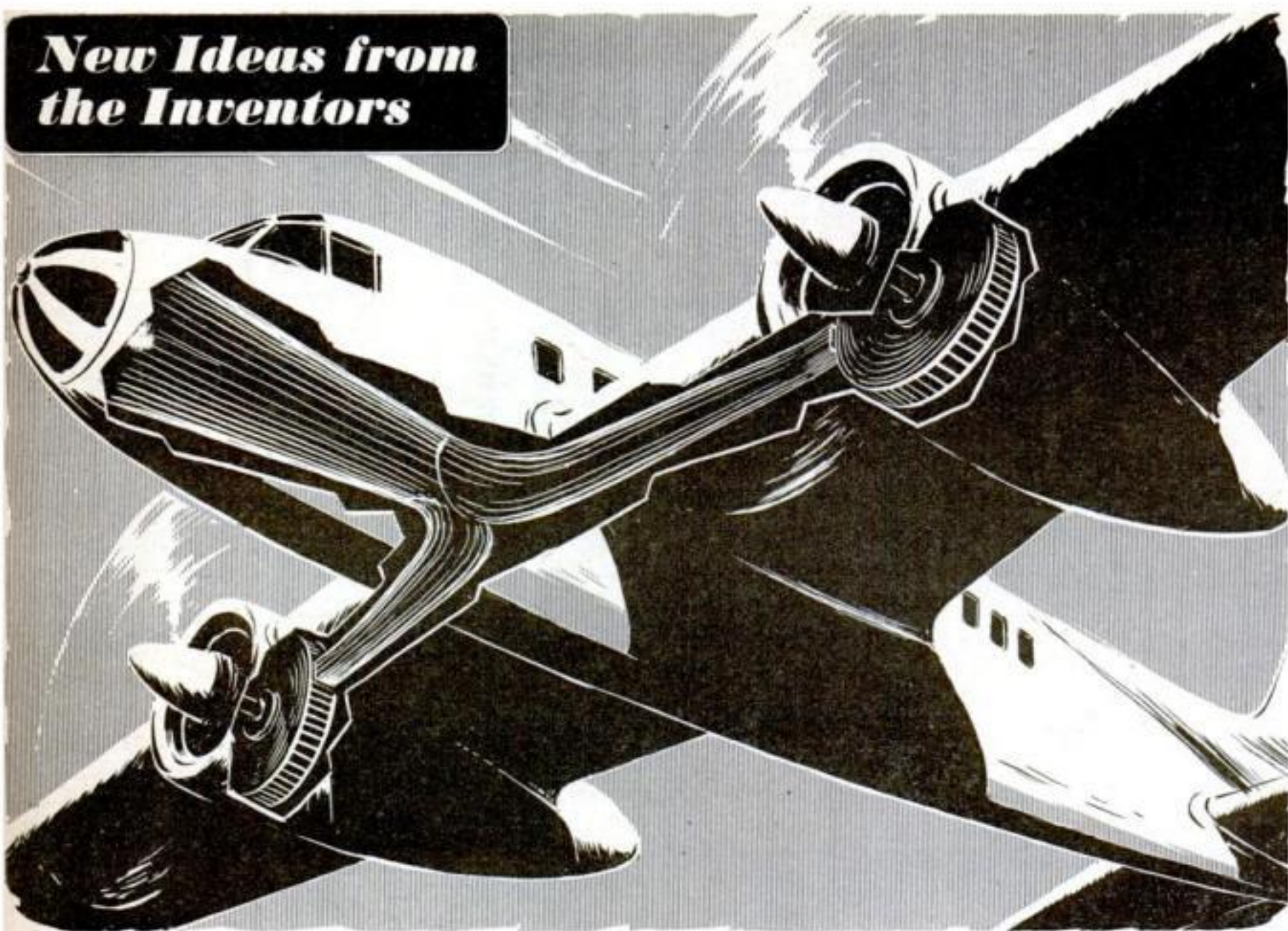
GERMANY. This American in the occupation forces has spoken to the United Nations from Germany—Lt. Richard B. McKlveen (D4AAM), of the 1st Constabulary Brigade in Wiesbaden.

NETHERLANDS. Jan H. Adams, of PA0FB in The Hague, had to hide his rig—and himself—from the Nazis during the war. Now he is back on the air with this 50-watt transmitter.

SWITZERLAND. Max Bischhausen, who operates HB9EC in Berne, is one of the many European amateurs using American surplus equipment—note the Signal Corps receiver in the background.



New Ideas from the Inventors



Air Gives Emergency Power. If one of its regular engines failed, this plane could still maintain smooth flight with the auxiliary air-propulsion system patented by R. P. Martin, of Seattle, Wash. Air is scooped

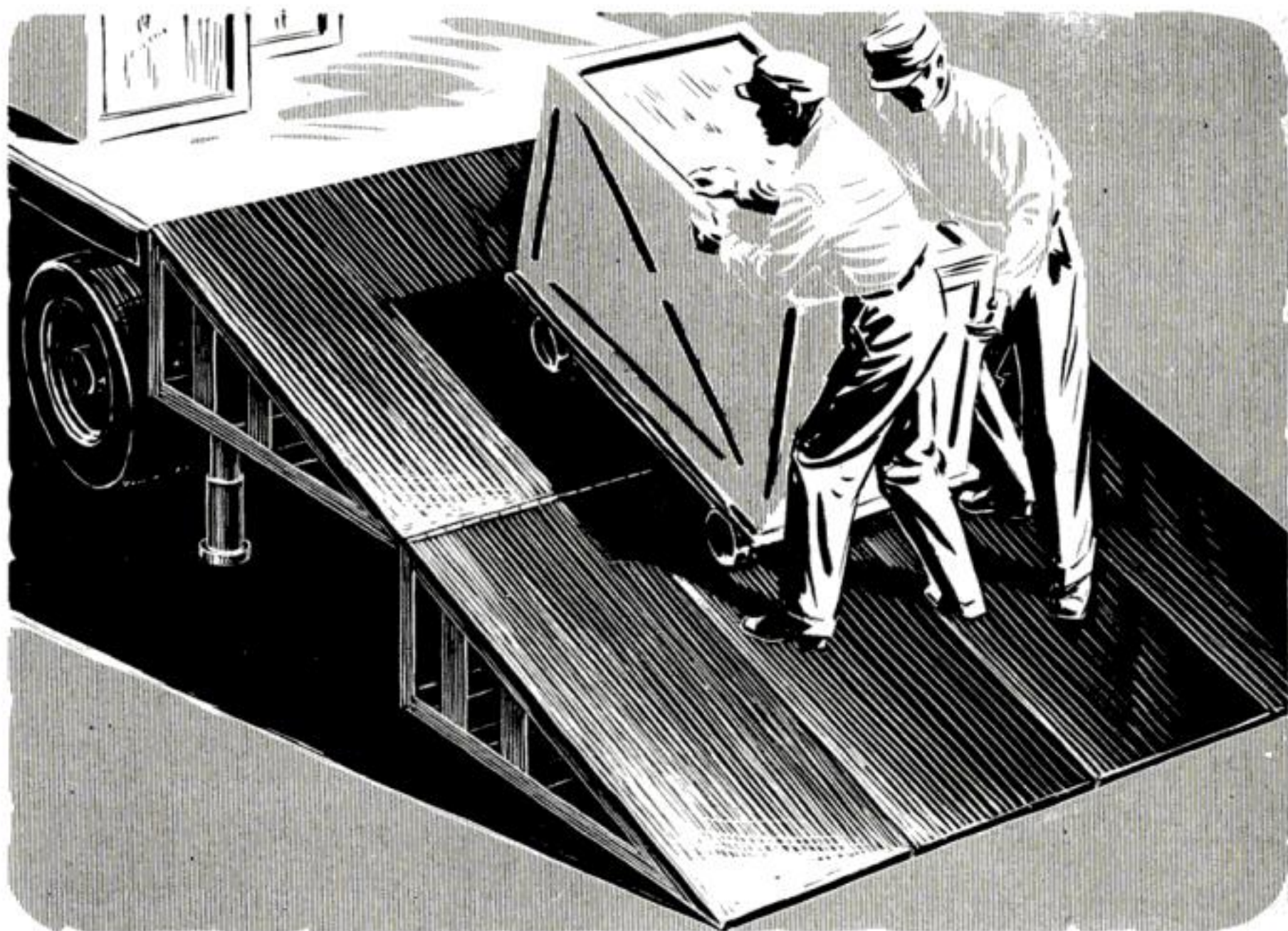
in through the nose and fed to air turbines that drive the propellers, keeping the plane from yawing and preventing the bad engine from completely stalling. The system can also provide extra power in emergencies.



Parking Aid Shows Wheels. Wriggling out of tight parking spaces would be a lot easier with this wheel-direction indicator invented by G. Leggett and C. Nathan, of Chicago. The front wheels on the small silhouette are geared by a flexible shaft to the car's steering column, showing the driver the exact position of car front wheels.



Baby Carriage Makes Suitcase. Traveling parents could carry this collapsible baby carriage right along with them, just like a suitcase. Its wheels are on two side panels that fold over the top, forming a suitcase-size box with clothes space inside and handles outside. Its inventors are L. Cooklin and T. Hollis, of Birmingham, England.



Truck Carries Own Ramp. No hoist is needed to load a truck equipped with this ramp, invented by E. C. Price, of Newburgh, N. Y. It's a boxlike extension on the rear of the truck, consisting of two

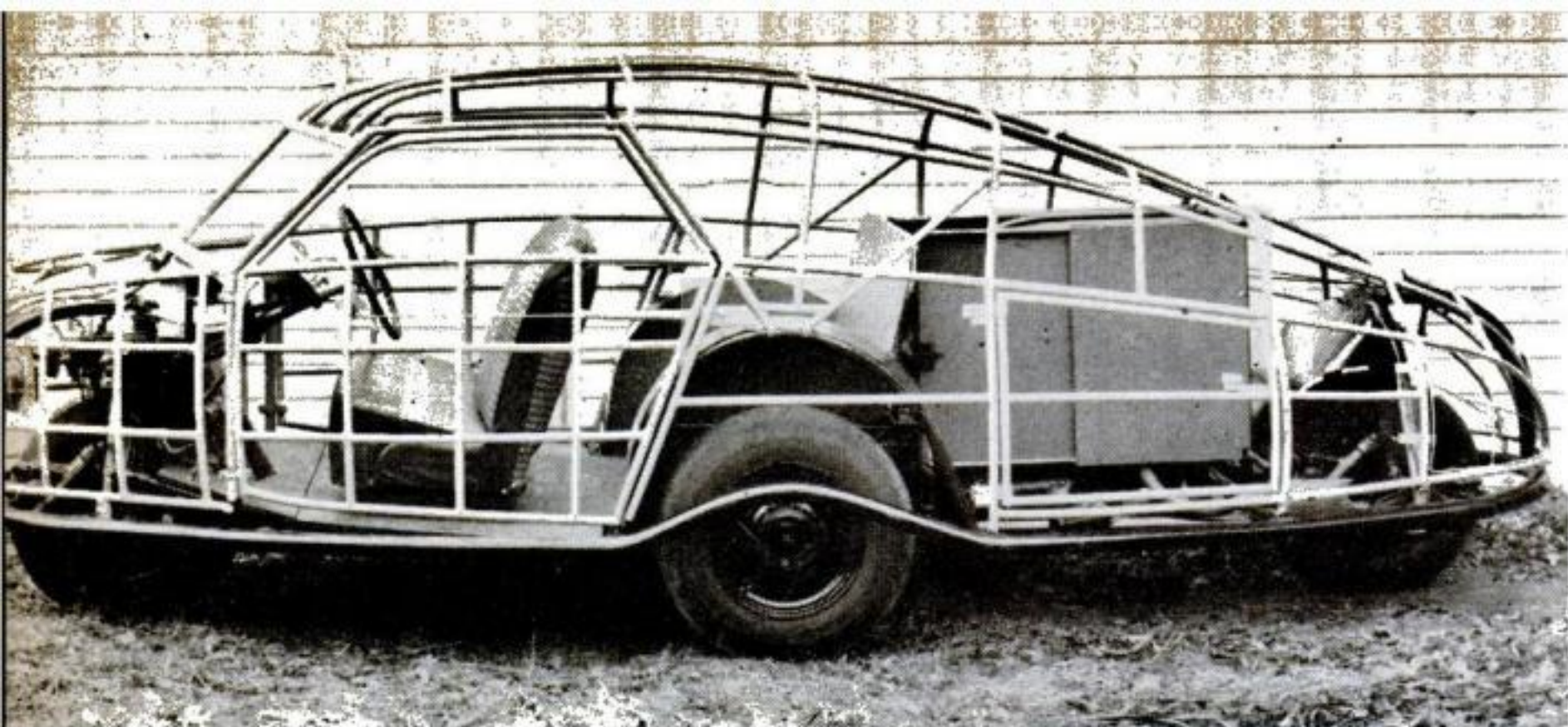
triangular sections hinged together. When the top section is swung down, it forms a ramp with the other on which heavy loads can be rolled on or off the truck. Jacks under the upper section keep the ramp rigid.



Wallet Can't Be Lifted. A pick-pocket would have a hard time getting away with this wallet. As it is pulled upward, two metal arms fall outward from the sides, locking it inside the pocket. To remove it himself, the wallet's owner must reach in and pull up the arms. It was invented by H. E. Stonebraker, of Rochester, N. Y.



Stake Saves Garden Labor. Just put your seeds, plus fertilizer or prepared soil if desired, in the bottom chamber of this stake, drive it in the ground—and wait for your plant. The hollow core, says inventor W. L. Gould, of Albany, N. Y., would feed water directly to the roots, while the shade would protect young shoots from the sun.

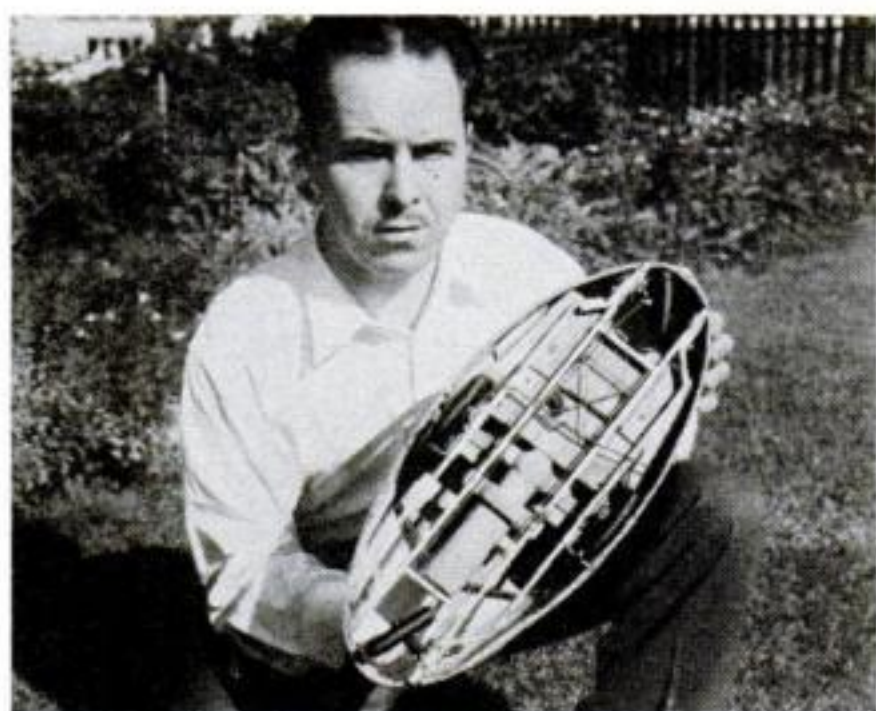


Homemade car has one wheel in front, one in back, two drive wheels in middle. View as it neared completion shows tube frame to which

steel panels were welded for body. Fireproof fiberboard box behind rear seat encloses Ford V-8 engine, transmission, and differential.



Two-door Gordon sedan is 63 in. high, 80 in. wide, 217 in. long, weighs 3,700 lb. Six persons can ride in its two wide seats. Builder hopes to put car into commercial production.



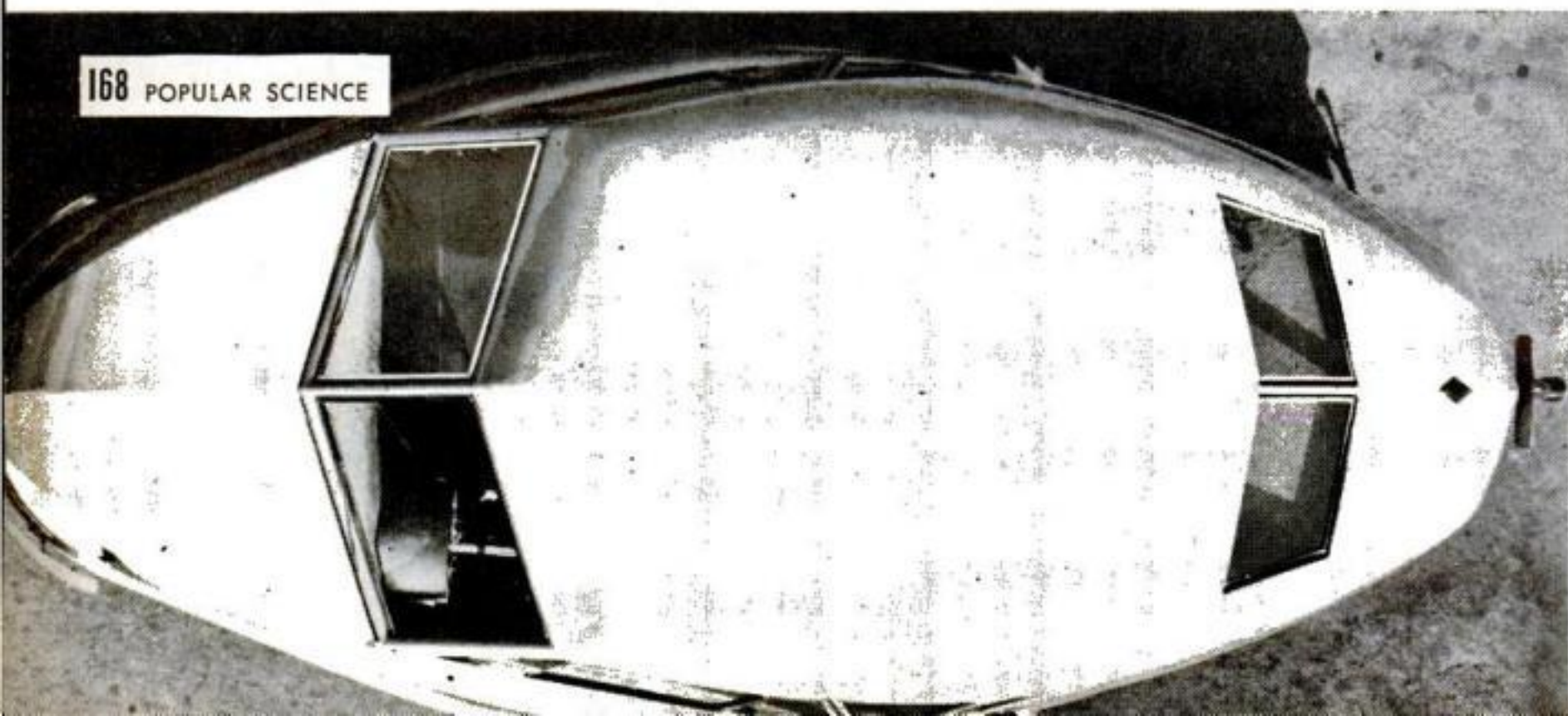
Steering turns front and back wheels in opposite directions, as shown in model held by inventor. Despite wheelbase 3 ft. longer than in most cars, it can turn around in 24-ft. circle.

Diamond-Shaped Car Skims Bumps

A CAR that takes bumps in three bites, instead of two, should ride easier, figured H. Gordon Hansen, of San Lorenzo, Calif. To prove his theory, he built the diamond-

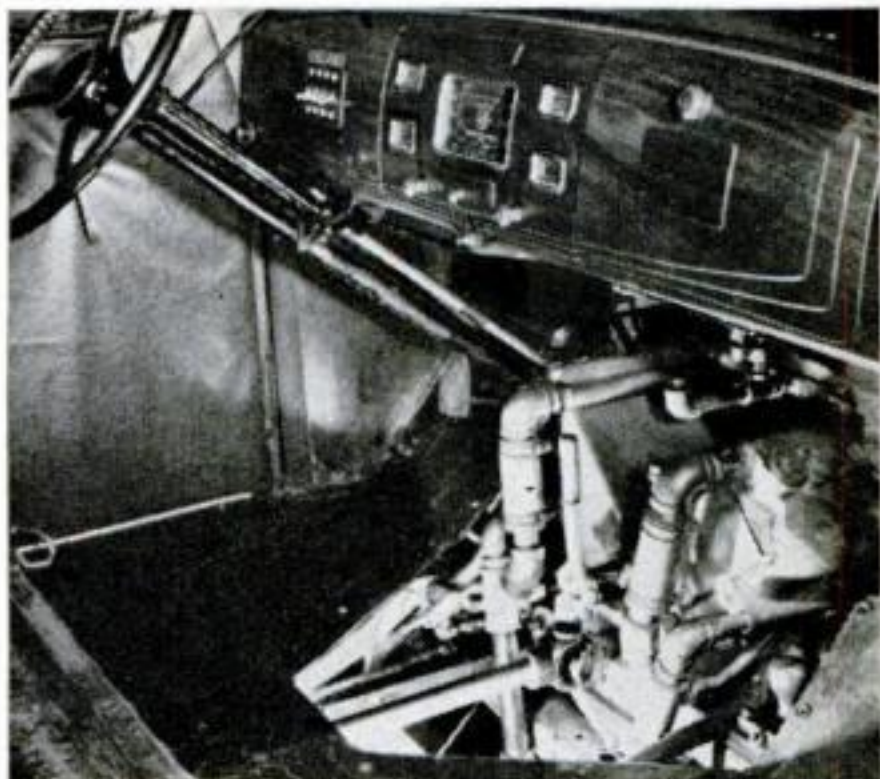
shaped auto shown here. "Driving it on a rough road," he says, "is like cutting diagonally across railroad tracks in a standard car." Cost: \$5,000 and 4,000 hours of work.

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A boiler nearly fills the engine compartment of a Terraplane [®] converted to steam. Below and ahead of it is the burner and blower assembly.

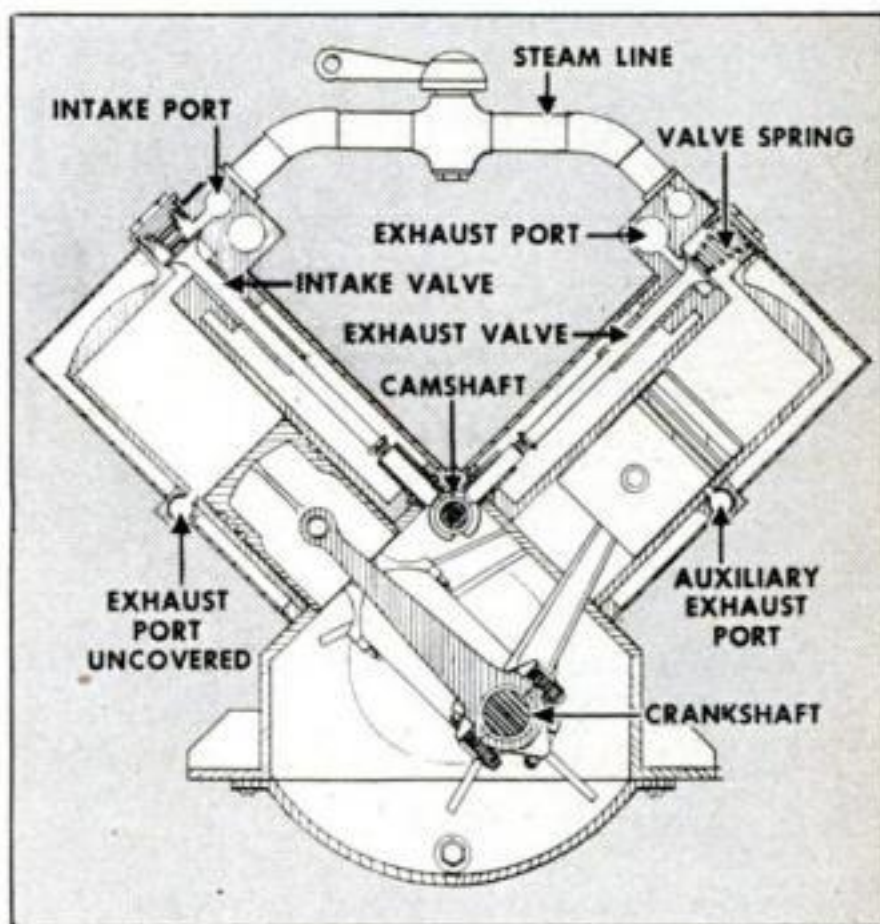


Between the exhaust pipes is the reverse lever, which slides camshaft. Notice the absence of a clutch. The old gear lever is throttle.

Steam Conversion Powers Stock Cars

AMONG those who believe that steam power for automobiles isn't dead is James H. Lawler, of Huntington Park, Calif. Having converted his own car, he's gone into the business of supplying a complete power plant for those who'd like to do a conversion job. Any medium-priced chassis is suitable.

The four-cylinder engine is a single-acting poppet-valve type of 3 3/16" bore and 4 1/4" stroke. Both crankshaft and con rods are modified Ford parts. The boiler is a flue-and-water-tube type with automatic controls. A complete power unit is priced at around \$500, but competent shop workers can cut a big slice from this by machining their own parts. Kerosene or No. 2 stove oil is used to generate steam.



\$6,000 Dutch Roadster Assembled from Ford Parts

THERE's little doubt that you'd twist your neck for a second look if you should meet this unusual automobile on an American highway. But there's not much chance you will. It's made in Holland and sells for somewhere around \$6,000.

Called the Gatso, the two-passenger roadster has a long-beam center light that can be used independently of the normal driving lights. Except for the aluminum body, the car is assembled chiefly from Ford parts. A plastic bubble top is removable. Maximum speed is said to be 105 m.p.h.





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Frowning, Senator Bombay leaned forward. An instant later both he and Gus jumped. A photographic flashbulb had flared vividly in their faces.

Politics and cars shouldn't mix, but Gus has to do some fast diagnostic thinking to keep them apart.

By Martin Bunn

SENATOR BOMBHEY'S red face had flushed to an apoplectic purple. His multiple chins quivered with righteous indignation. "Again, and again, it has happened!" he boomed. "And again, and again mechanics of the highest competency have examined and tested my car, and have found in it no slightest mechanical defect. I suspect—nay, I *charge!*—that nefarious forces are working in a dastardly effort to prevent me from presenting my program for prosperity, productivity, and peace to my beloved fellow citizens!"

"Gee, Senator!" There was awe in Stan Hick's voice. "You mean someone's sabo-

taging things—international spies, maybe?"

The Senator hadn't the slightest suspicion that anybody had tampered with his car—but election day was close at hand, and experience had taught him that the public often reacts to a scattergun accusation in a manner highly profitable to its maker. Puffing his fat cheeks, he frowned portentously, and rumbled: "Subversive forces—working, possibly without his knowledge, in the interest of my opponent in the coming trial at the polls, J. Lester Smith!"

Joe Williams, who covers the town for the *Evening Alarm*—a city paper that beats the drum for Bombay—had driven into the Model Garage shop with the Senator, and had listened to his remarks with an expres-



Gus Troubleshoots an Election



sion of fathomless boredom. Now he asked: "Can I use that, Senator?"

Bombey saw a heavenly vision of big, black headlines. "Yes, you may use it! And you may quote me!"

While Williams scribbled, the Senator turned back to Stan. "Well," he demanded, "what do you propose to do about my car?"

"Gee, Senator—I dunno!" Stan sputtered. "If you think someone's been monkeying with it, and everything, I guess the boss had better look it over. He's in the office. I'll call him."

The Senator is no favorite of Gus Wilson. "That old windbag here again?" he grouched when Stan told him he was in the shop. "What's the matter with him now?"

"His car goes flooey on him every once in a while. He says he's had it in a lot of good shops, but none of them could find out what makes it act the screwy way it does." Stan lowered his voice to a cagey half-whisper. "The senator just told Joe Williams, from the *Alarm*, that J. Lester

Smith is doin' something to his car to keep him from makin' his speeches and gettin' reelected—it'll be in tonight's paper!"

Gus grinned sardonically. "If I thought J. Lester was that big a dope," he scoffed, "I wouldn't vote for him—even against Bombey." He turned serious. "But a charge like that, made too late for it to be proved false, might do Smith a lot of harm." He thought hard for a minute. "Yes—that might do it."

Gus picked up the telephone from Joe Clark's desk, and called a number. "*Sentinel*?" he said. "Mary there? . . . Hello, Mary. Gus Wilson. Bombey's here with Joe Williams, hurling charges that J. Lester's minions have been doing things to his car to keep him from getting to political meetings. It might be worth your while to come over. . . . Yes—just drop in, casual like. . . . Okay."

Followed by Stan, he went into the shop. Senator Bombey extended a fat hand while he extracted a cigar from a pocket of his



vest with the other one. "Ah, my good friend Gus Wilson!" he sounded off. "Have a see-gar, Gus!"

"Thanks, Senator—never smoke 'em. Stan, here, tells me you're having trouble with your car. What seems to be wrong with it?"

Senator Bombey narrated his automotive tribulations with his usual oratorical trimmings. The hard core of his recital was that because his chauffeur had broken an arm he had been compelled to drive himself for the past ten days. During that period the performance of his car had been featured by a high degree of undependability. One day it would climb a steep hill like nobody's business; the next day it would limp up the same grade with its engine laboring and just manage to make it to the top. One day it would cruise on the level at a smooth and effortless 65; the next day it would have to be coaxed over that same road at a ragged and sputtering 30, its engine cutting out and giving every indication of being starved for gas—although a check always showed that there was plenty in the tank.

"The sinister aspect of the matter," the senator wound up, "is that these unexplained failures practically always occur while I am on my way to speak at some important political rally. Yesterday evening I was to address a large and enthusiastic gathering in Brookville at nine o'clock. I started in good time, but my car almost stalled on a hill, and subsequently ran so badly that I had to stop at a crossroads garage. When I reached Brookville, the Town Hall lights were out and everyone had gone home!"

Mary Manning, our local *Sentinel's* combination reporter-photographer, had driven her convertible into the shop, and had sat listening to Bombey's peroration. Now she got out and went breezily over to his car.

"Hello, Mr. Wilson!" she hailed. "There's

something the matter with my lights—will you look at them, please?" She seemed to see Bombey for the first time. "Why, Senator! How nice to run into you like this!"

Bombey looked at her the way an amateur gardener might examine the first blisters of ivy poisoning between his fingers. He grunted.

"Well, Senator," Gus said briskly, "you tell me you've had your car in several shops. What did they do to it?"

They had done plenty, Bombey growled, and charged him plenty for doing it. One mechanic had diagnosed the trouble as a defective fuel pump, and had installed a new one. Another had diagnosed intermittent internal collapse under suction of a flexible fuel hose, which he had replaced. A third decided that the fuel pump's filter-bowl gasket was defective, and put in another one. Others had suspected dirt in the fuel line, the screens, the gas tank, or the carburetor, and had carefully cleaned—or re-cleaned—all of them. The car had responded to each of these treatments, but never for long. Always, after a few hours or a few days, it had relapsed into the same unpredictable, unreliable behavior.

"All of those fellows who worked on your bus can't be dopes," Gus told the Senator. "We'll have to do a thorough job of troubleshooting. That may take quite a while."

Joe Williams whispered urgently in Bombey's ear—the *Alarm* reporter didn't want to lose the first-page story he was building around the senator's vague accusation. After a moment Bombey nodded agreement—he wouldn't get headlines if Gus found some mechanical condition which would explain his car's queer goings-on. Thinking fast, he consulted his watch, and then shook his head.

"I must be in Glendale at five," he said.

"It's an hour's drive over there, and it's past three now. I'd be wasting my money if I paid you to start an important and—er—complex examination which you couldn't complete in the limited time that is available for your expert labors."

He started to climb into his car, followed by Williams. Mary laughed. "Scared of what Gus will find, Senator?" she taunted.

Bombey glared. Joe Williams scowled. Gus grinned and returned Mary's lead. "I'll make you a sporting proposition, Senator," he offered. "If I don't find out what's the matter with your bus inside half an hour, I won't charge you a cent. Is it a go?"

Bombey couldn't think of any way of wiggling out of that. He nodded sour agreement.

Gus jumped into the Senator's car, and drove out of the shop and up the highway. When he was clear of town he speeded up. The car ran smoothly and with reserve power at 65, and whizzed up a steep grade without a falter.

Back in his shop he didn't waste time checking things he knew already had been checked and rechecked. "Whatever's causing the grief," he reasoned, "it's something that happens only part of the time. It could be an electrical connection that works loose under certain operating conditions."

He checked the ignition system, giving particular attention to the connections. He didn't find anything wrong with it.

Gus scratched his ear. "Let's see, now. It can't be the fuel pump—that's been changed . . . The fuel line has been cleaned out more than once . . . The carburetor—"

He examined it, its connections, and the automatic choke linkage. All seemed in excellent working condition. Bombey was grinning. Gus glanced at the shop clock and saw that he had less than ten minutes left.

As he turned back to his tough problem he noticed the new flexible hose running from the car's frame to the fuel pump. It had been installed after the trouble had developed, so it couldn't be causing it. But there was something about the 45-degree pipe-threaded elbow fitting connecting the hose and the pump which didn't seem quite right. Twisting it gently, he found that it wasn't snug. He tried to set it up snugly but couldn't do it because of the drag of the hose.

Gus chuckled as he straightened up. "There's the cause of your trouble, Sena-

tor," he said. "If that fitting was connected as snugly as it should be, it would make up toward the engine so that the hose couldn't be connected to it. So the mechanics who have worked on your car haven't been drawing it up tight, and under the pull of the hose it has backed off a half turn—enough to allow an air bleed sufficient to reduce fuel pump suction and starve your engine for gas. That's easy to fix. I'll install another elbow, one that fits properly, and—"

"You'll do nothing of the sort!" barked the senator. "I refuse to accept such an absurd explanation, or to pay for a repair which obviously won't help matters! If what you say were true, my car wouldn't run perfectly most of the time!"

"That's the tricky part of it—why those other fellows didn't find out what was the matter," Gus said. "Even under the handicap of that air bleed, the pump was able to deliver sufficient fuel *under most conditions*. But it always was a close thing, and any additional handicap—such as a slightly dirty carburetor filter, or the low fuel head of an almost empty tank—would result in faulty performance." Gus pointed at the elbow fitting. "Try it yourself, Senator—you can feel that it is loose."

Frowning, Bombey leaned forward. Then both he and Gus jumped. A flashbulb had flared vividly in their faces.

Mary Manning smiled at them. "Just a candid shot of Senator Bombey being shown the cause of the car trouble which he charged was the result of sabotage by J. Lester Smith," she said sweetly. "It'll look swell on the front page." Her tone sharpened. "How about keeping this campaign more or less clean, Senator? The *Sentinel* won't use this picture unless the *Alarm* publishes your groundless accusation. Which way do you want it?"

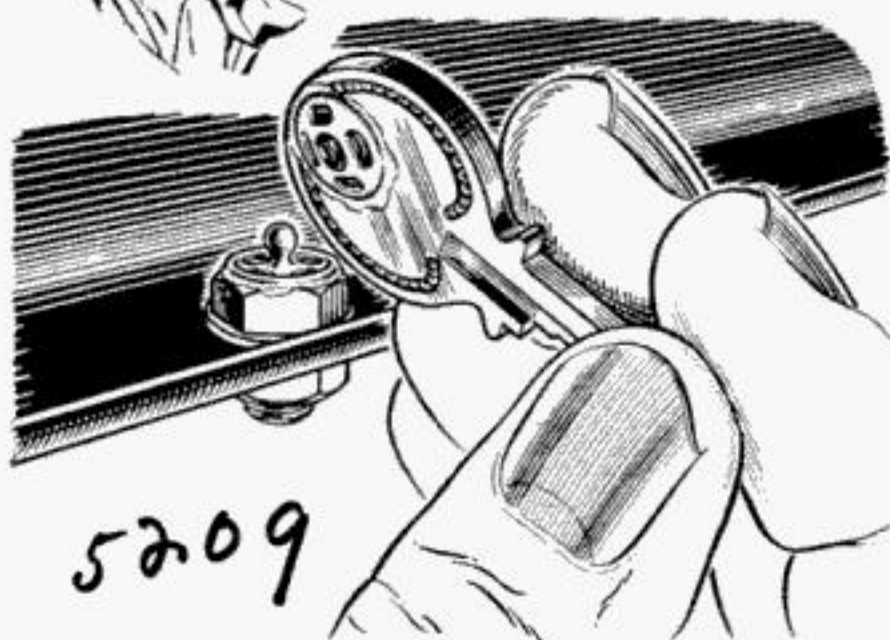
Senator Bombey looked at Joe Williams. Joe shrugged helplessly. The senator puffed out his fat cheeks. "In all my years in public life," he boomed, "I never have made a charge which I have been unable to back up with convincing proof. Like everyone who knows him, I have unbounded faith in Gus Wilson. He says that this—er—gadget is the cause of my difficulties. I accept his opinion!"

Gus grinned. Then he looked at the shop clock. "Five minutes to go!" he said. "I'll install that new fitting, Senator—and if you have any more trouble—maybe I'll even vote for you!"

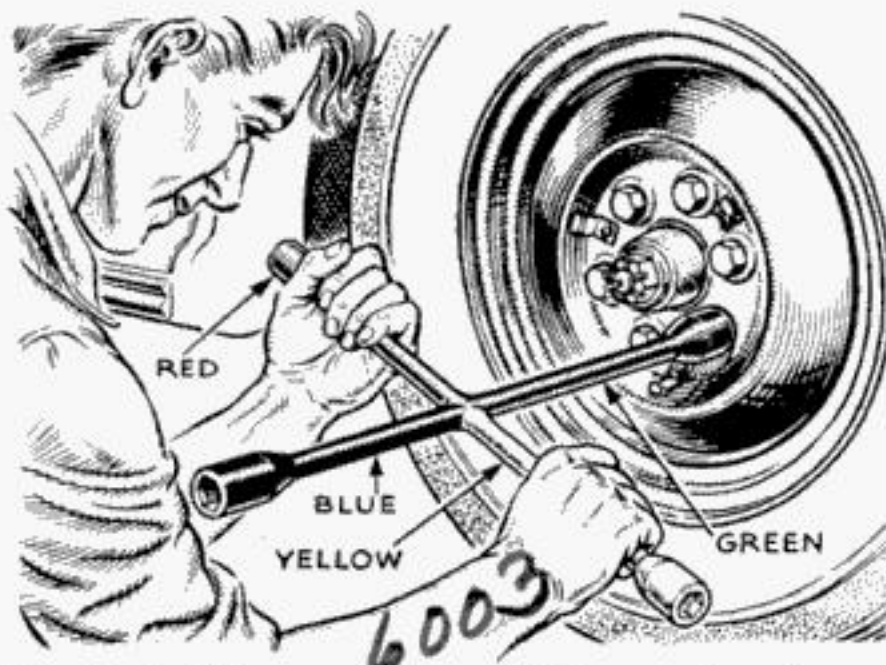
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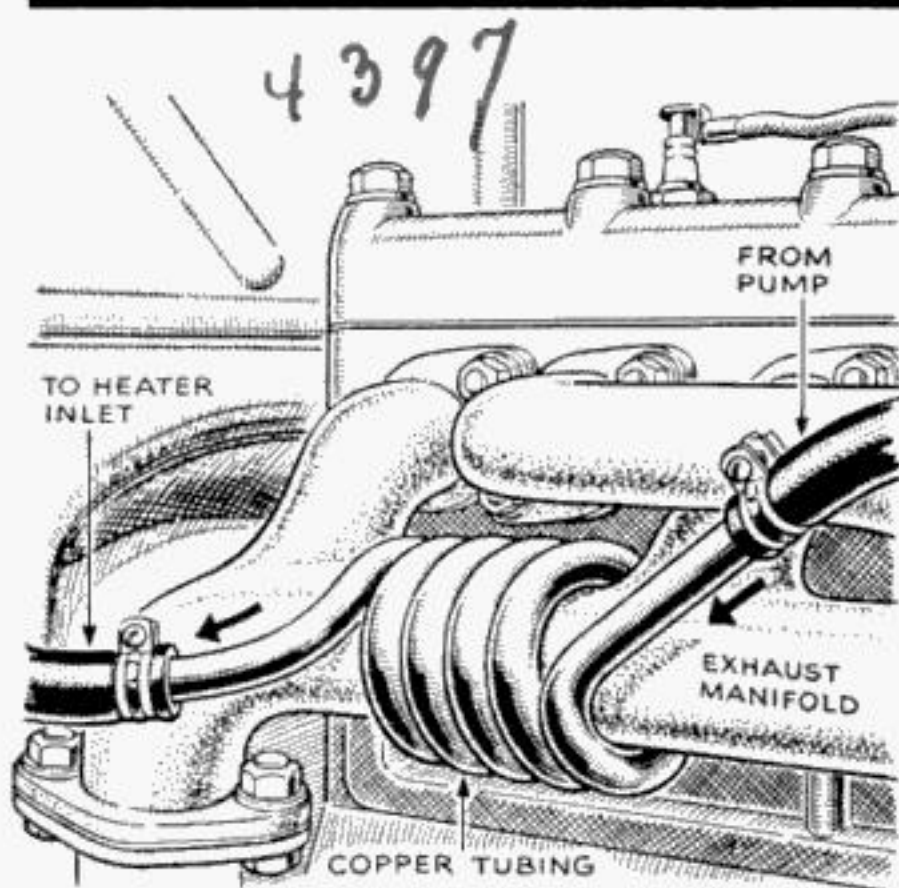
Hints from the Model Garage



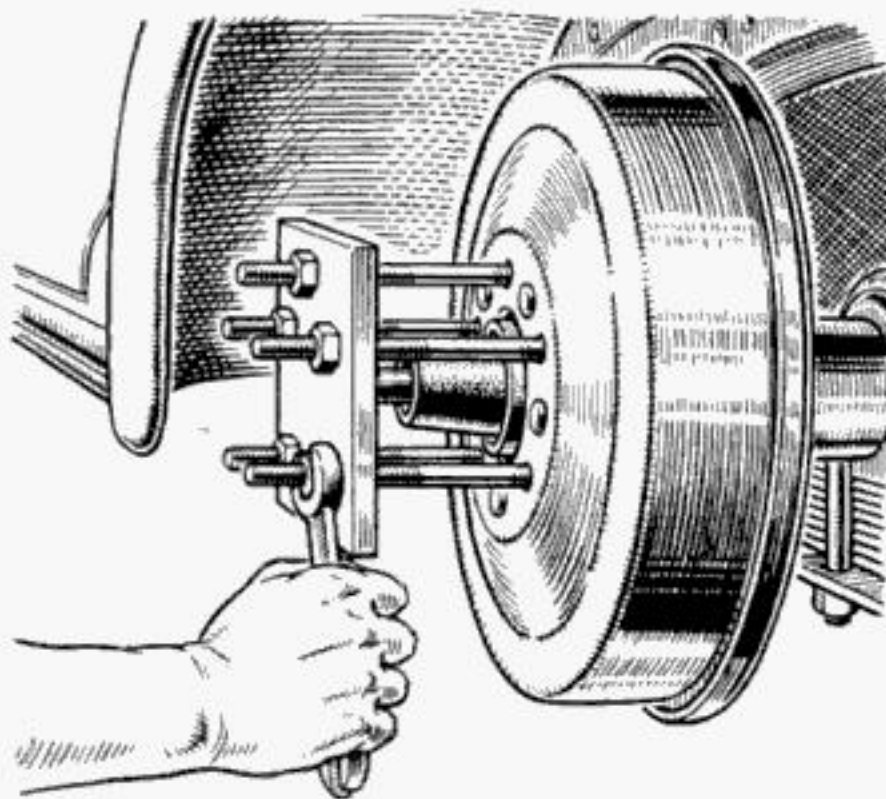
Key Hidden on Dress Snap. If you'd like to keep an extra gas-cap key hidden in your car, here's one way of doing it. Solder half of a dress snap to the key, the other part to the head of a small bolt. Then insert the bolt in any convenient hole—in the dash flange, glove compartment, or other place where the key will be out of sight.



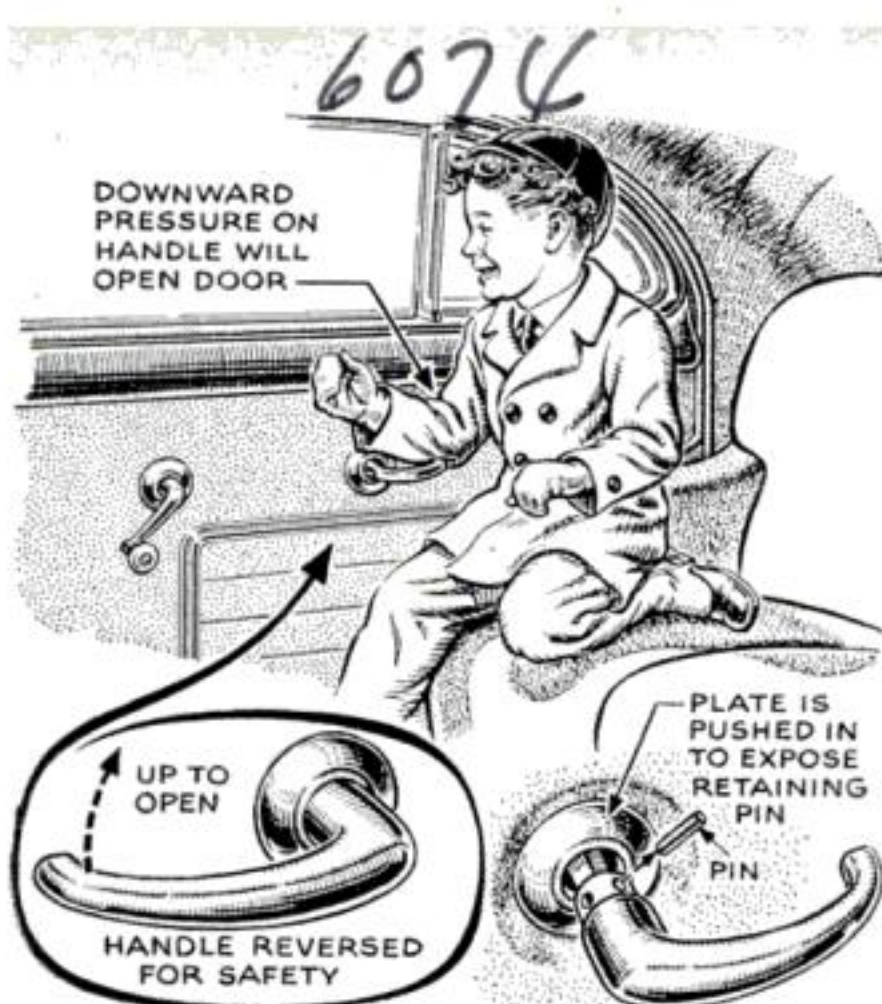
Paint Your Tire Wrench. Some good ideas are so simple that you wonder why a lot of people haven't tried them. Here's an example. Regis Gutwald writes from Minneapolis that he has painted each arm of his tire wrench a different color. When the wrench is laid down during a job, the color helps identify the socket in use.



Heater Output Boosted. John P. Berkyta, of Lyndhurst, N. J., writes that the hot-water heater in his car failed to provide the warmth he likes. He solved the problem by making use of some of the heat that's wasted out of the exhaust pipe. Taking a length of copper tubing, he wrapped it several times around the exhaust manifold, connecting one end to the heater and the other to the pump.



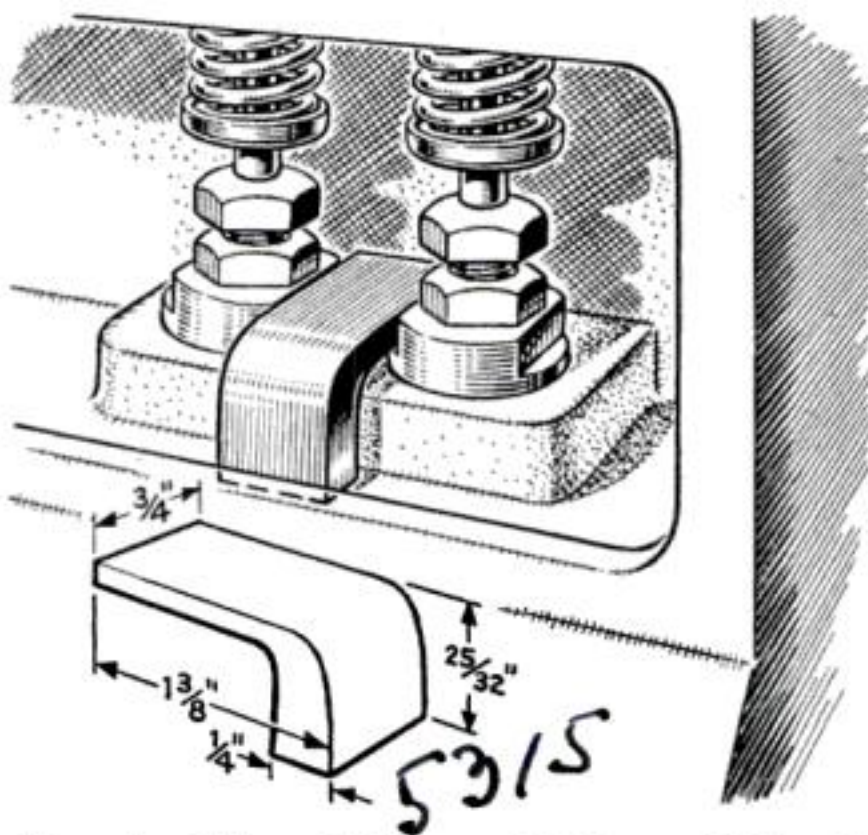
Stubborn Wheels Come Off. Here's a wheel puller devised by Raymond Holtz, of San Francisco. It consists of a square of $\frac{1}{2}$ " steel plate and five studs. Five holes in the plate match those in the brake drum. One end of each stud is threaded to go into the brake-drum holes, the other to take a standard nut. In use, the nuts are tightened alternately. Pressure against the axle pulls the wheel.



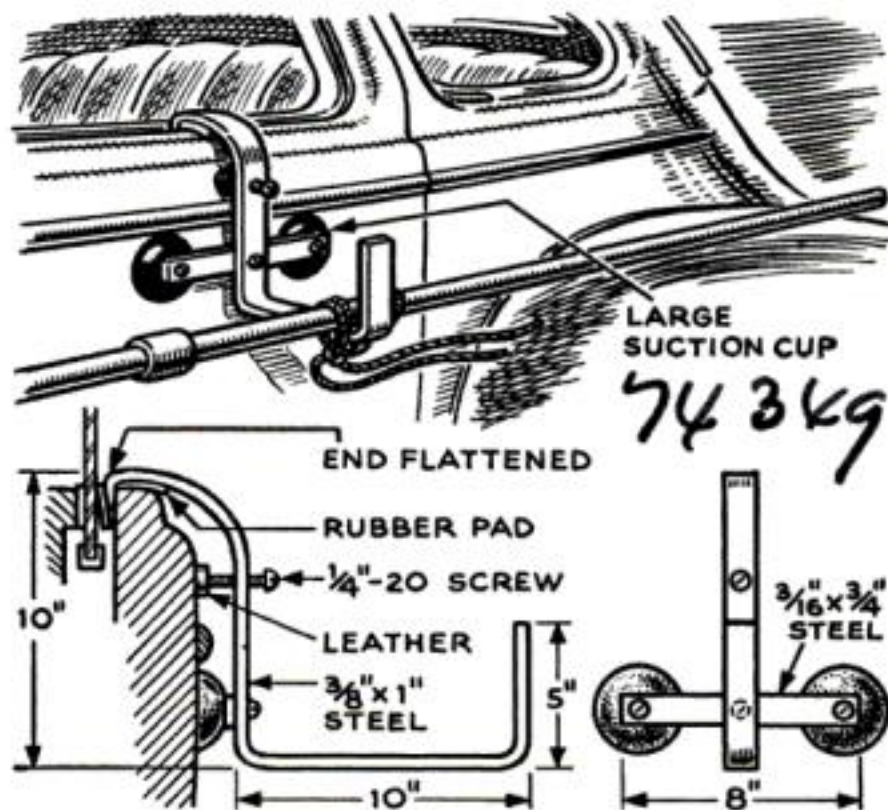
Children Can't Fall Out. In some cars, the handles are pressed down to open the doors. This is a hazard, since any rider, especially a child in the back seat, may lean on the handle and open the door by accident. S. W. Trosell, of Manhattan, N. Y., found a simple solution for this. He reversed the handles.



Syringe Used as Siphon. Neoprene tubing, a short piece of copper tubing, and a syringe may be quickly assembled to siphon gas from a car. File a half-round hole in the copper. To use, compress the syringe bulb, place your thumb on the hole, allow the bulb to expand, and uncover the hole. Remove the syringe when gas starts.



Tool Simplifies Valve Work. Here's just what the doctor ordered for adjusting Kaiser valves. Machined to an exact width of $\frac{3}{4}$ " the tool slips between the flats of adjoining cam followers. This jams them, leaving your hands free to make the adjustment. The longer arm is filed to $\frac{1}{8}$ " thickness. A. G. Patrick, of Hot Springs, Ark., made the tool when he found there wasn't space for a conventional wrench.



Brackets Carry Pipe. If you sometimes must carry long lengths of pipe, lumber, or other materials on a car, a pair of removable brackets like this will make the job easier and prevent the finish from being scratched. A $\frac{1}{4}$ "-20 screw clamps the flattened top end of the bracket to the car. Use at least $\frac{3}{8}$ " steel, or heavier if possible. When the brackets are complete, give them a coat or two of paint.



Before the day of special-built tracks, auto speed tests were confined to long road races.

Model Recalls Early ⁵¹⁴⁵ Days of Road Racing

Forty-three years ago this month the model's prototype was hailed as America's foremost racing car.

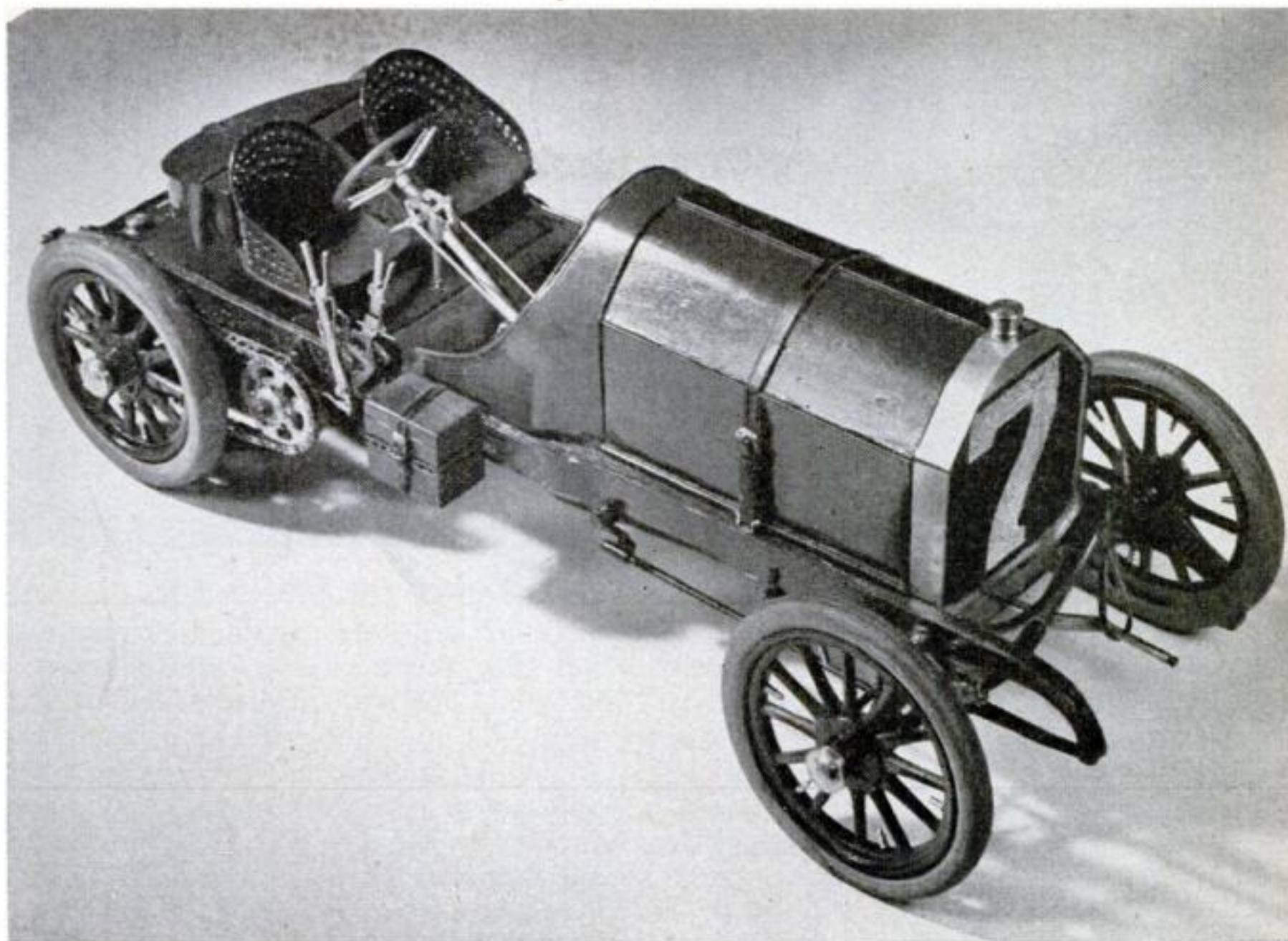


IN 1905 the Locomobile Company spent \$18,000 to build a special racing car, shown in model form on the opposite page. With Joseph Tracy, now a New York City automotive-research consultant, as driver, the car was sent to France for the Gordon Bennett race there that year. It finished out of the money.

However, in October of the same year, Tracy drove it to third place in the Vanderbilt Cup race on Long Island, N. Y. This was then the closest to victory that an American car had come in an international race. Encouraged by this showing the company then built a second car based on No. 7.

There was very little difference between the two. The 1906 racer—now owned by Peter Helck, well-known illustrator who made the etching on this page—hit 108 m.p.h. with Tracy at the wheel at the first trials. And the car earned America's first Vanderbilt Cup victory in 1908. The finely detailed model of old No. 7 shown here was built by Orrin Brusie, at left above with Mr. Tracy, its original driver. Here are some specifications of the old car: four-cylinder block cast in pairs with a copper water jacket; 120 hp.; bore 7"; stroke 7"; weight 2,000 lb.; wheelbase, 109"; overhead valves; front tires, 3.50 by 34; rear, 4.50 by 34.

Millerton, N.Y.



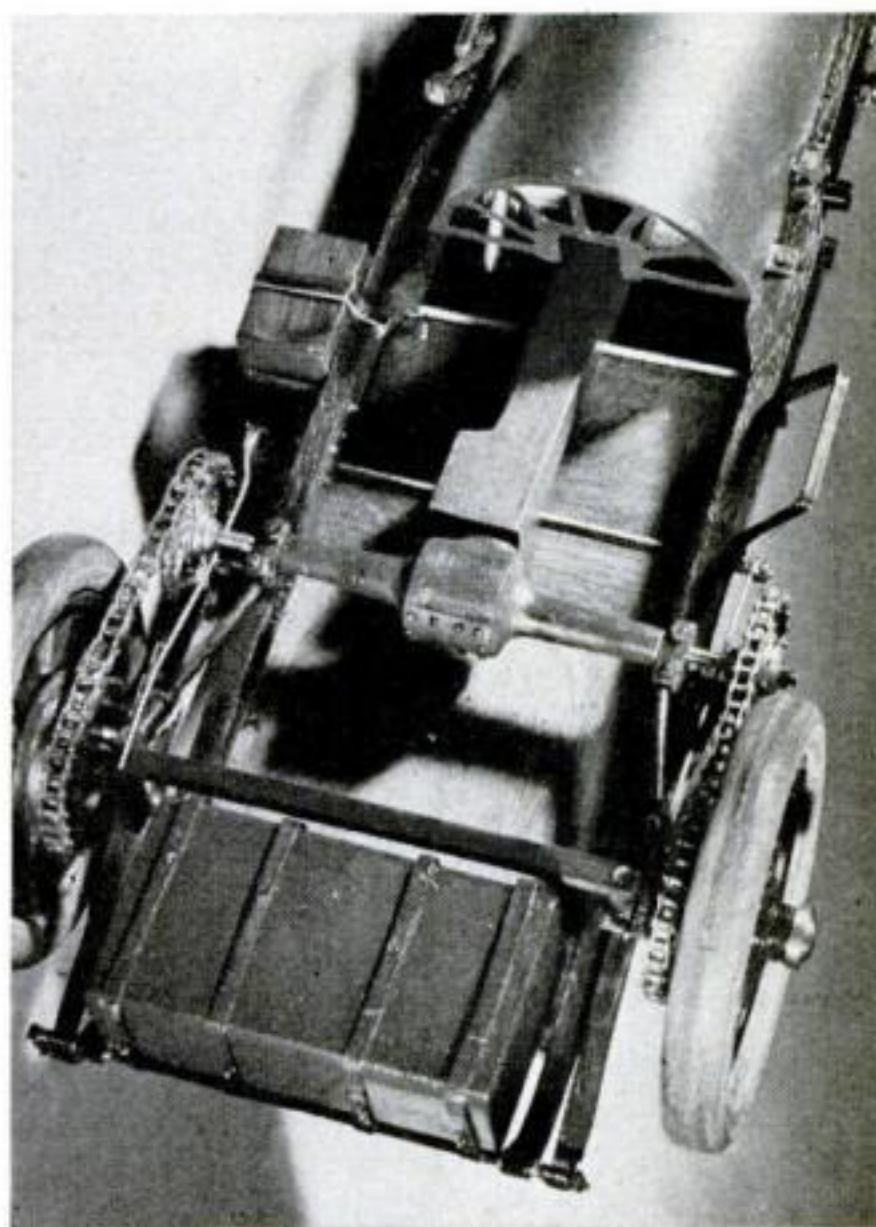
Steering gear and chain drive both operate. Levers are gear shift, nearest driver, and brake.



Carefully following the particulars of the big car, the model even has a set of tiny wrenches in the toolbox behind the bucket seats.



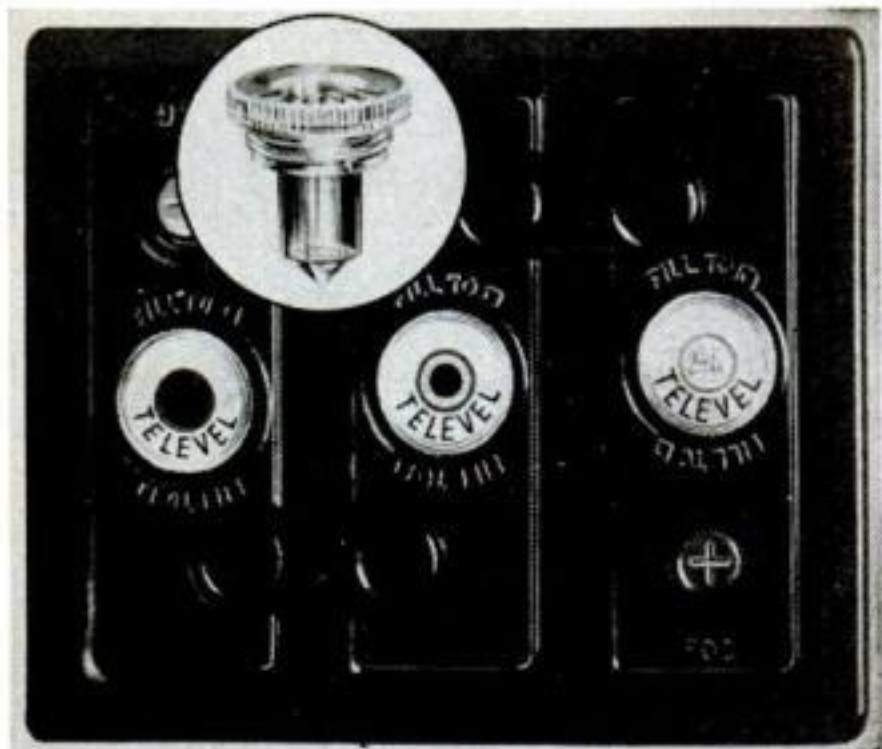
Ticket box is near gear and brake levers. Road racers stopped when entering and leaving towns, where officials stamped time on tickets



and put them in the sealed box. Lost time was deducted from the total at the end of the race. At right note chain drive to both rear wheels.

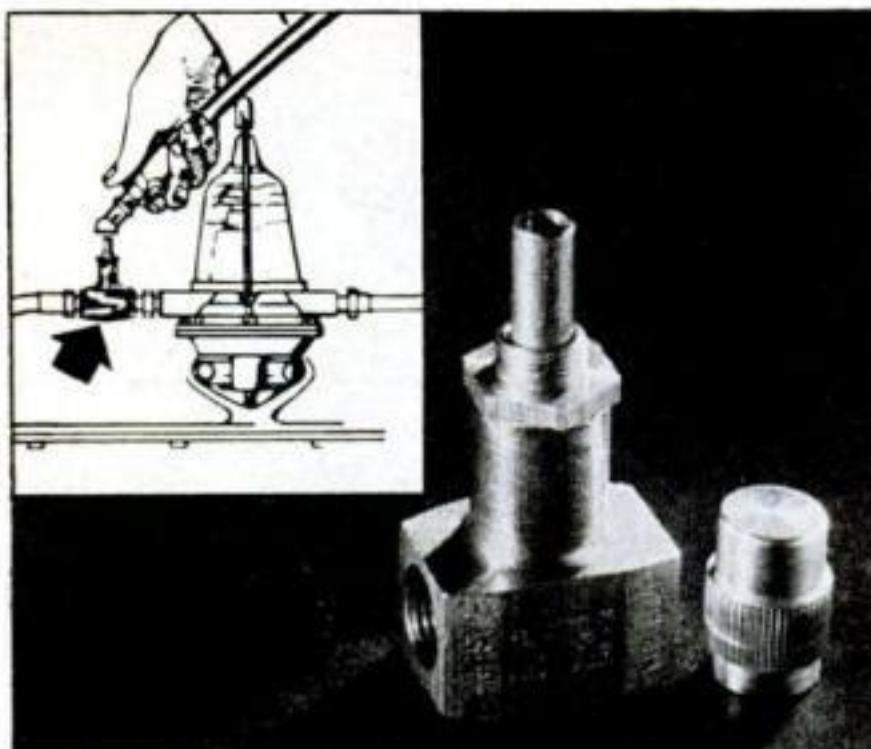
5380

5150



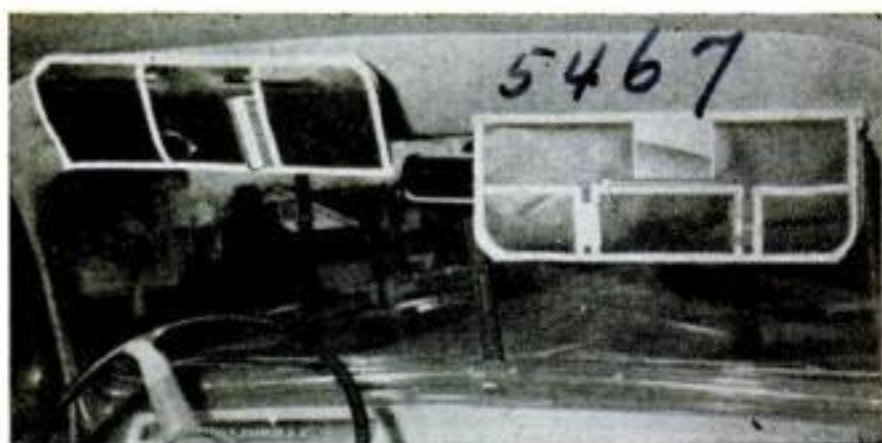
Plug Warns of Low Water

BATTERY plugs that read "Add Water" when the level in a cell is low (right above) have been developed by the National Battery Co., St. Paul, Minn. The warning words are molded in the clear plastic plug, which has facets on the bottom. When a cell has sufficient water, the facets are covered and a solid black disk shows.



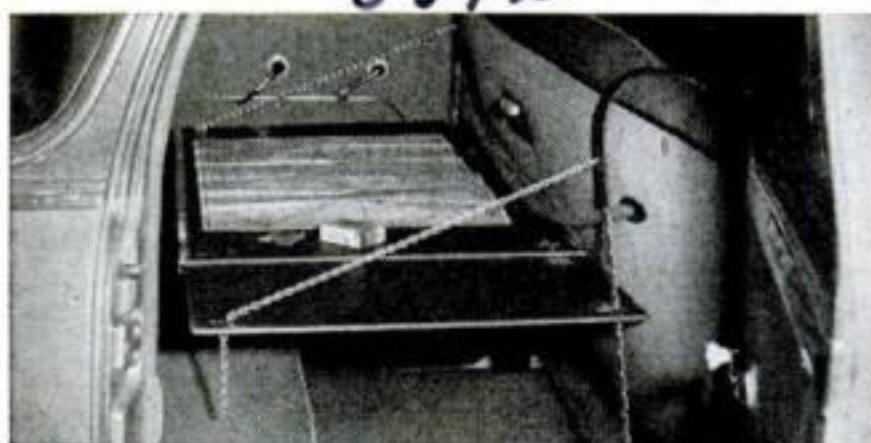
Air Valve on Gas Line

INSTALLED between the fuel pump and gas tank, this device lets you blow out an auto fuel line without disconnecting it. Air pressure cannot injure the pump itself, since it can be applied only when a protective valve stem is pushed down. A tire pump or air hose supplies pressure. The maker is the Kler-Line Corp., Caldwell, N. J.



New Job for Sun Visors

THIS new cover for auto sun visors holds many items up out of the way, but still within easy reach when you want them. Horizontal and vertical pockets of various dimensions are provided for credit cards, maps, cigarettes, sunglasses, coins for parking meters, cosmetics, and other small objects. The cover, designed by J. M. Axford, of Portland, Ore., slips snugly over a visor like a glove.



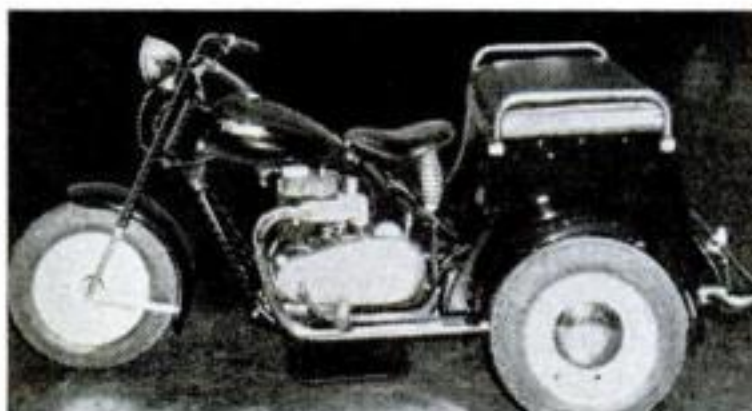
Auto Table and Nursery

SET up in the rear of a sedan, the Auto-den © combines a traveling nursery and table. In the position shown above, it makes a table for typing, eating, or games. Lowered to rest on the rear seat, it forms a bed or playroom for a child. Since it then completely fills the space between front and rear seats, there is little danger of harmful falls. The Linne Products Co., of Santa Monica, Calif., offers it at about \$9.

Three-Wheel Motorbike

5468

THE three-wheel Mustang has a conventional automobile differential packed in grease in a leak-proof housing. A 9½-hp., one-cylinder, L-head engine drives the 360-lb. outfit 70 miles on a gallon of gas. Small parcels may be carried in the compartment under the seat. Johnson Motors, Inc., of Pasadena, Calif., is the distributor.



Mechanics and Handicraft

REG. U. S. PAT. OFF.

Remote Tuner Reaches Radio

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Drum Table Turns Your Way

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Remote tuner runs your radio from anywhere in the room. Page 224.

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Drum Table Swings Things Your Way

By Glenn A. Wagner 51 Winnetka
Road, Delmar, Maryland

HERE'S the familiar Lazy Susan of the dinner table scaled up to create real comfort in the living room. When you sit alongside this drum table, nothing on it is farther away than your finger tips.

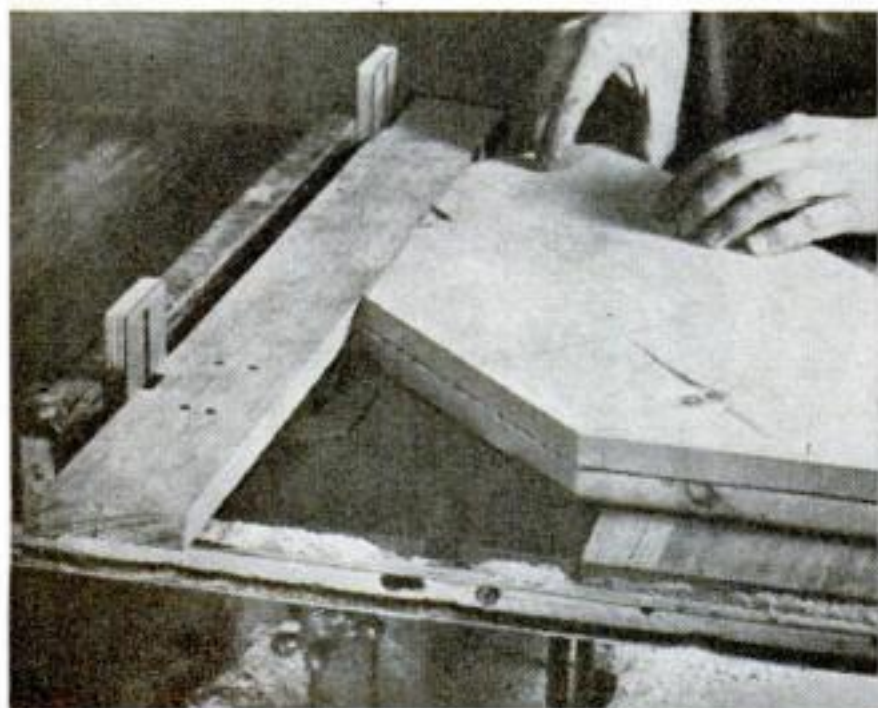
A push of the fingers will swing its contents your way—radio, books, magazines, smokes, or drinks. An extra advantage is that a loop-antenna radio can be turned for peak sensitivity and best reception with little effort. No electrical gadgetry is necessary; lamp and radio cords are simply left slack. You can fit a stop to limit turning and prevent "wrapping up" the wires.

Knotty pine was used for the original

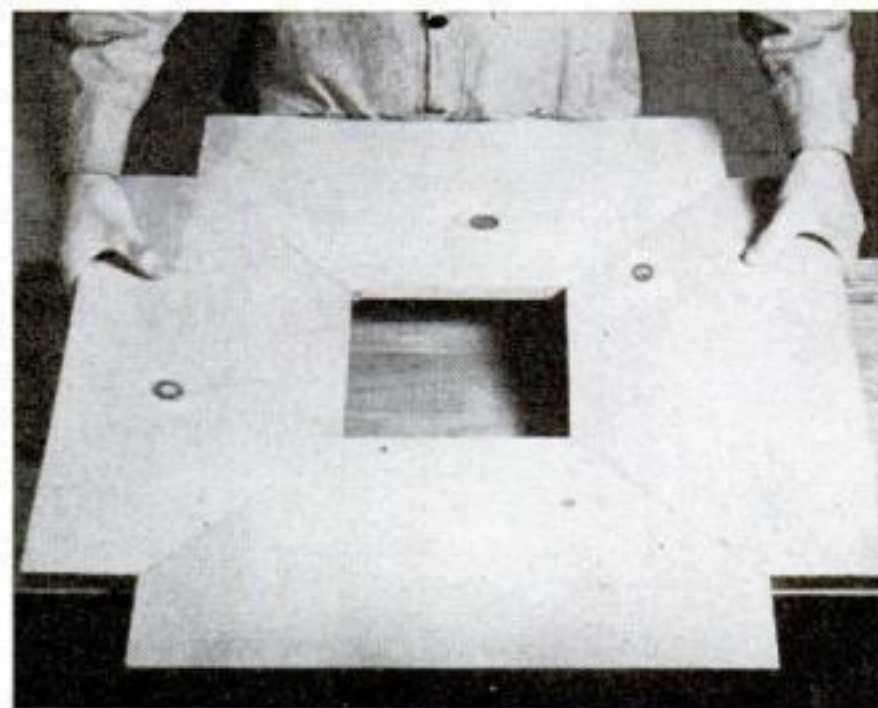


table, which was designed to be built of $\frac{3}{4}$ " by 12" lumber. As shown in the step-by-step photos, construction is a nice job for a circular saw, bandsaw, and shaper. But if you haven't power tools, the splined joints can be butted and glued instead, being reinforced by the tops and bottoms of the corner boxes. Edges can be rounded with rasp, spokeshave, and sandpaper. The plywood column can be built of $\frac{3}{4}$ " thick segments, either rounded or left octagonal, and attached with brackets to the cap and base.

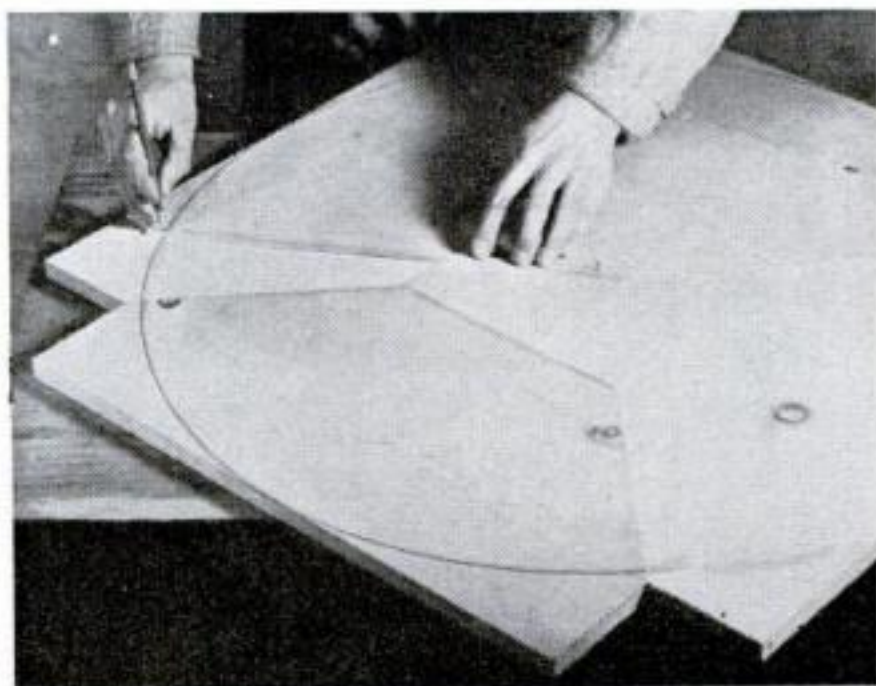
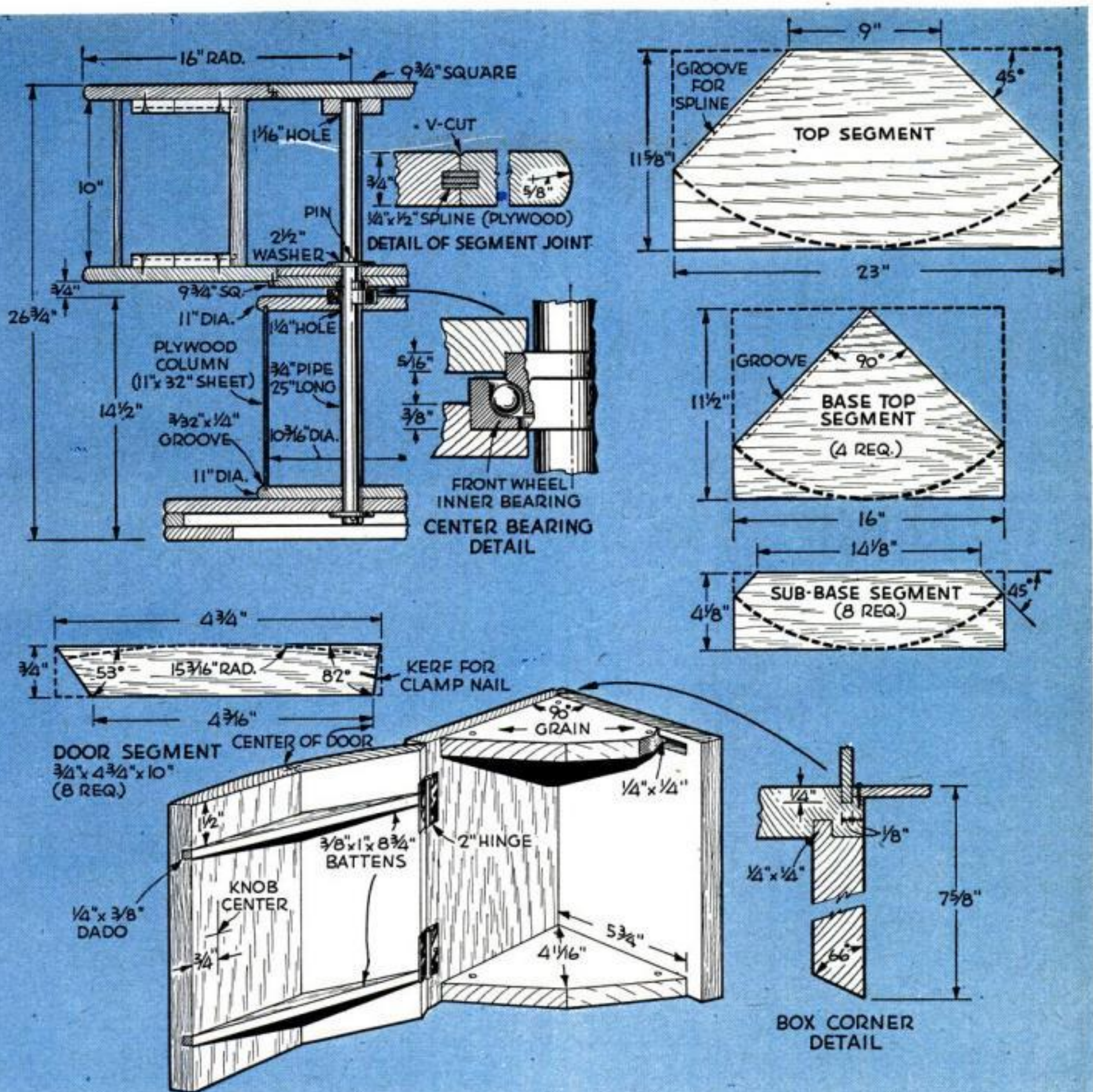
Two coats of light stain, followed by waxing, provide the soft sheen so desirable on pine. Brass hardware goes well with it.



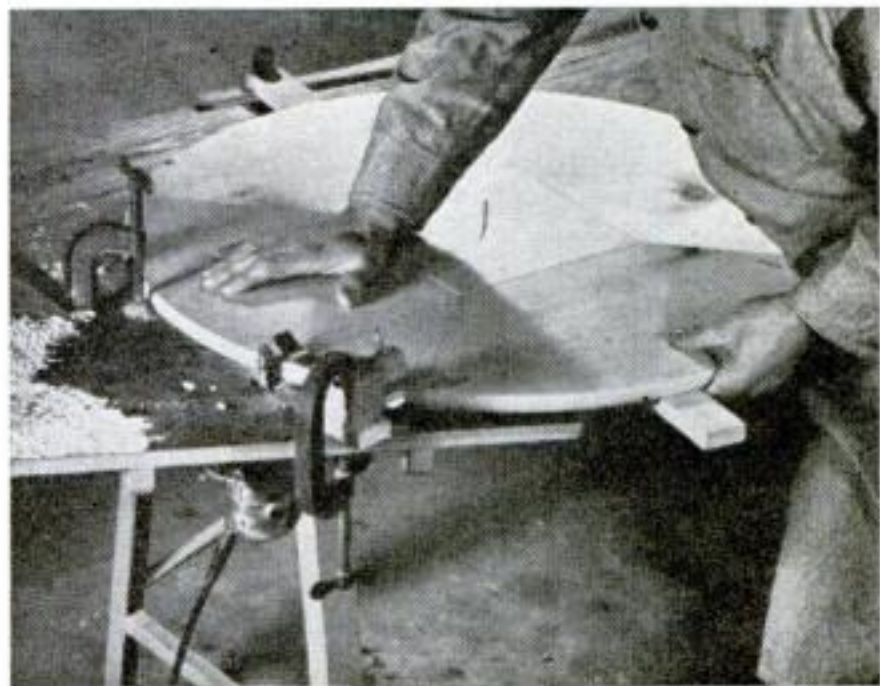
1. Pattern sawing is the smart way to cut the segments. A master pattern tacked to the stock is run against an auxiliary fence (PS, Sept. '48, p. 201) to cut eight pieces for two disks.



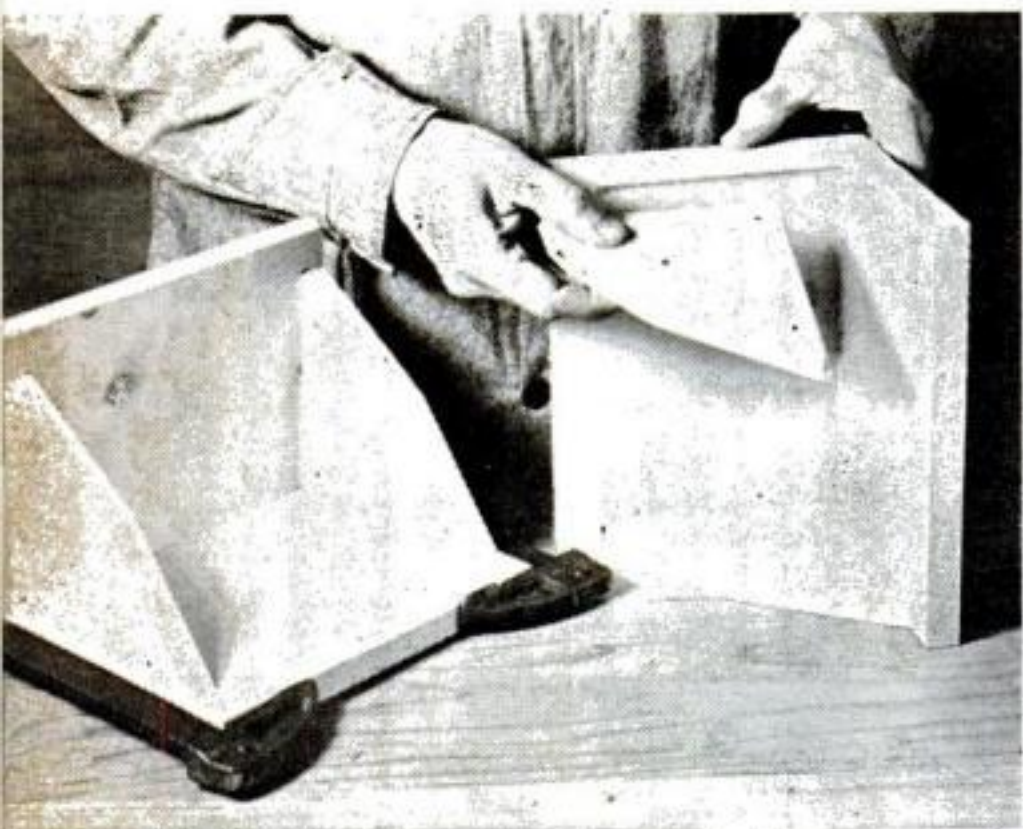
2. Cut spline grooves $\frac{1}{4}$ " by $\frac{1}{4}$ " on the mitered edges, beginning at inside corners but stopping short of outer ones so splines won't show. Rabbet inside edges of segments in one disk.



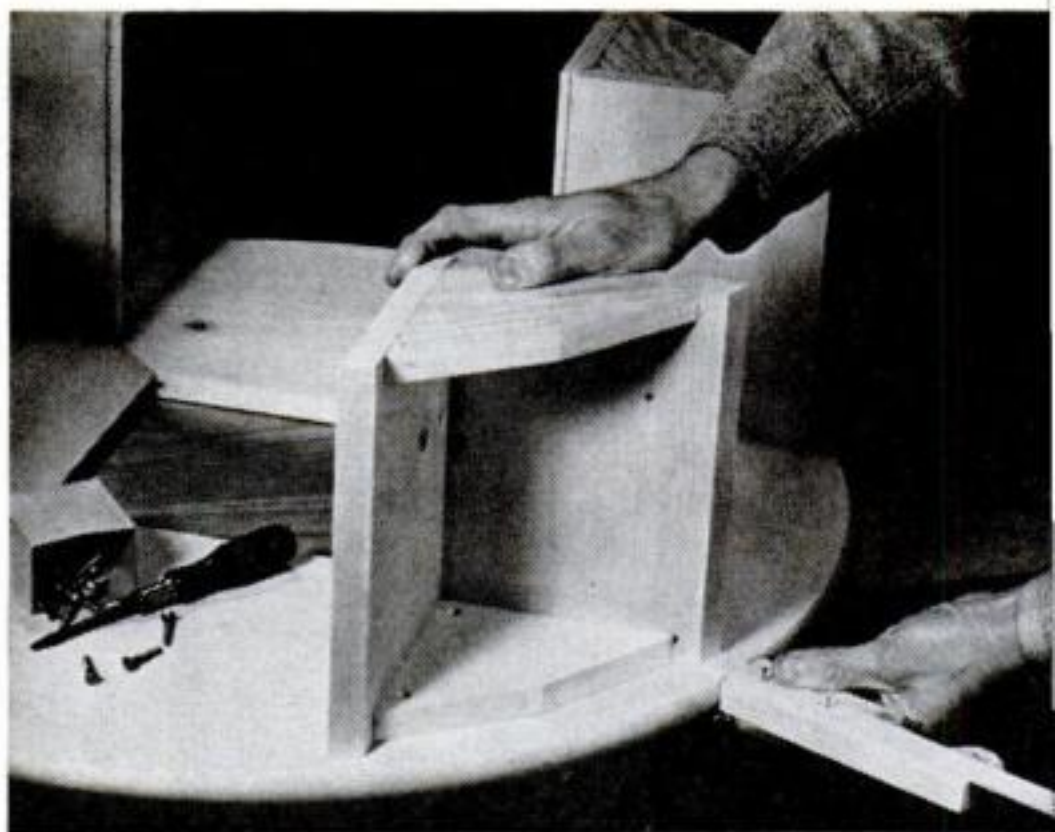
3. Assemble with plywood splines. Rabbet center panel to fit inside of rabbeted edges. Use a trammel or a stick pivoted at the center to swing the contour. Bandsaw disk to shape.



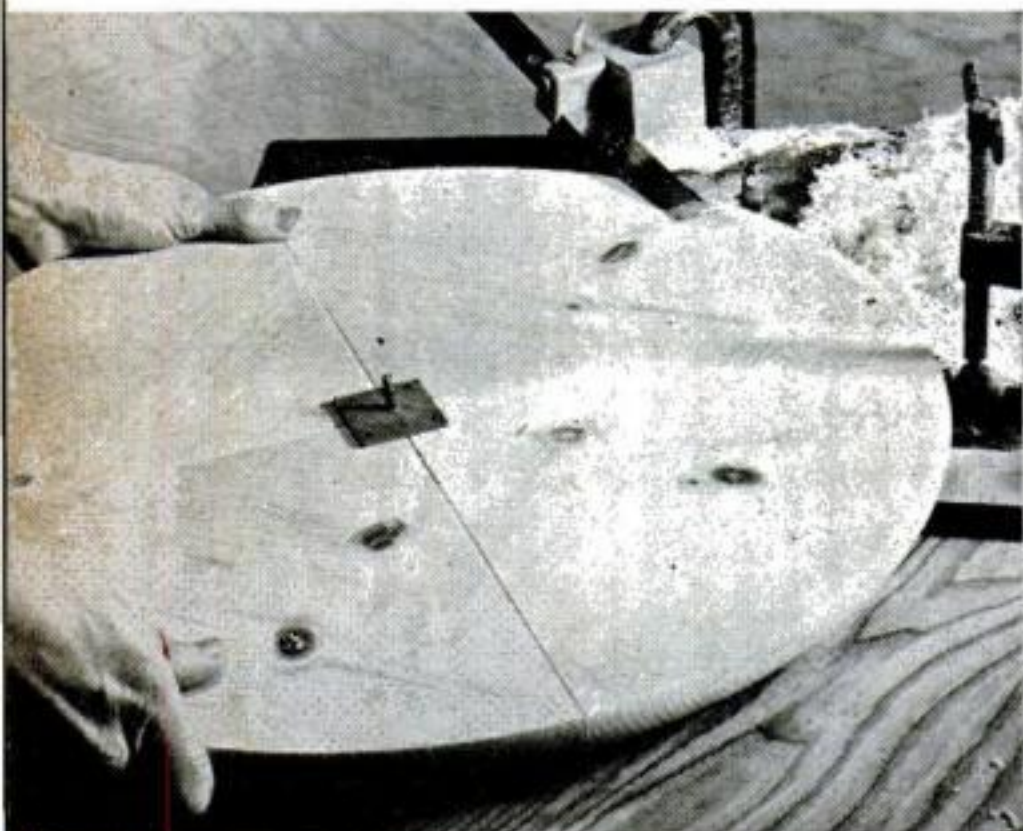
4. Shaping edges is being done with an undermounted router here. Disk pivots on a pin and a hold-down is clamped before cutter. A similar tool setup appears in Fig. 10, next page.



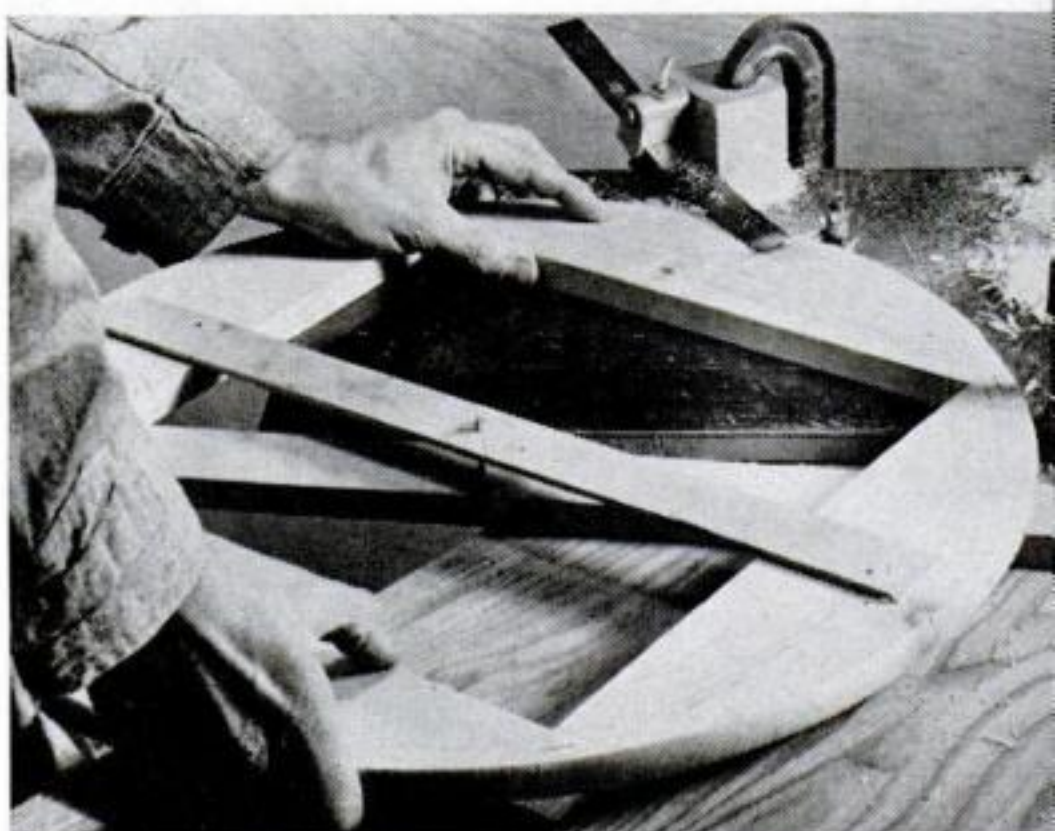
5. Four corner boxes are built as separate units. Pattern-saw the eight top and bottom members. Although joints shown are tongue-and-groove, well-glued butt joints will serve.



6. Center the boxes on the mitered segment joints, using a simple homemade gauge as above to insure uniform setback from the edge. Three screws top and bottom join boxes to the disks.



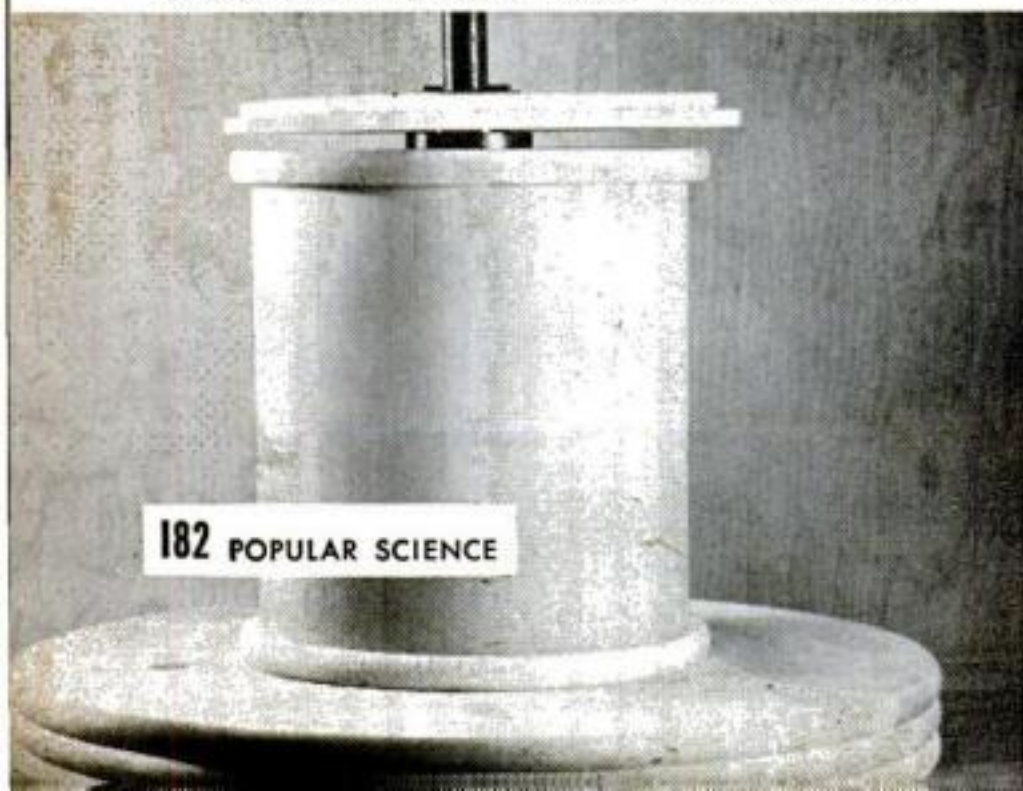
9. Start the pedestal by gluing up the top of the base with spline joints as before. Here the edge is being shaped with the same router setup used for the table disks.

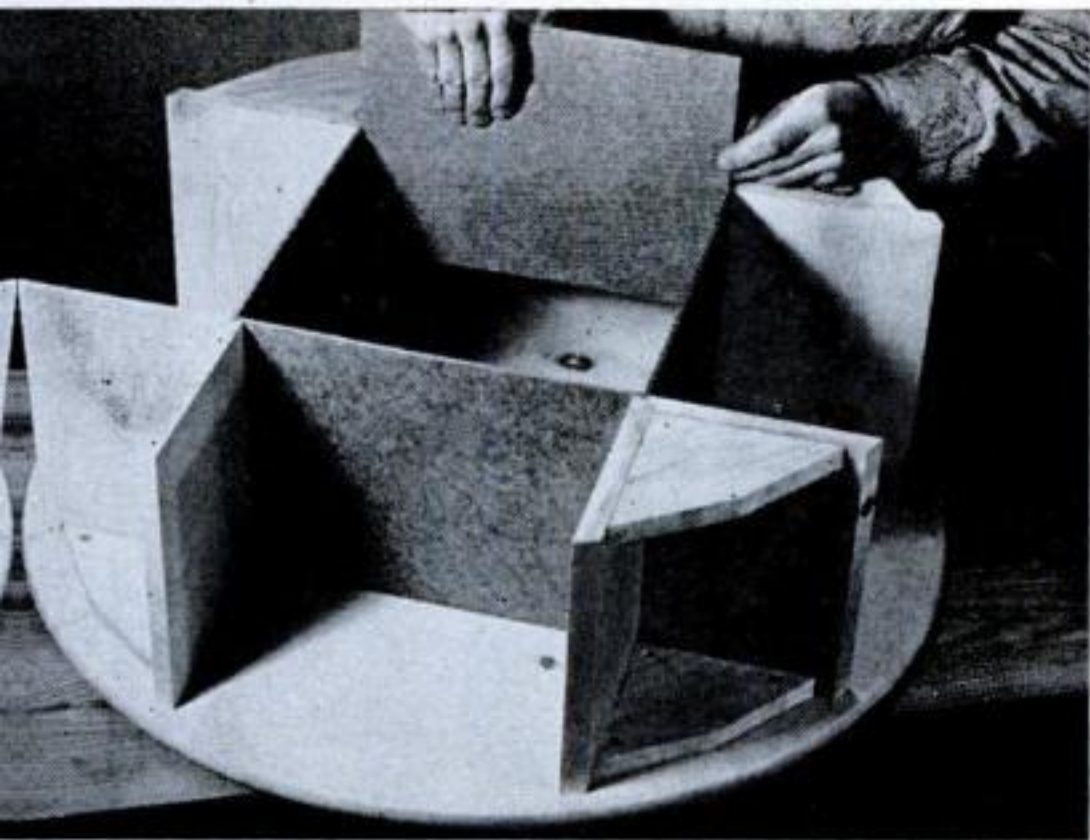


10. Two sub-base frames are needed. These are mitered, but joined with glue and clamp nails instead of splines. A temporary batten provides a center for pivot in shaping.

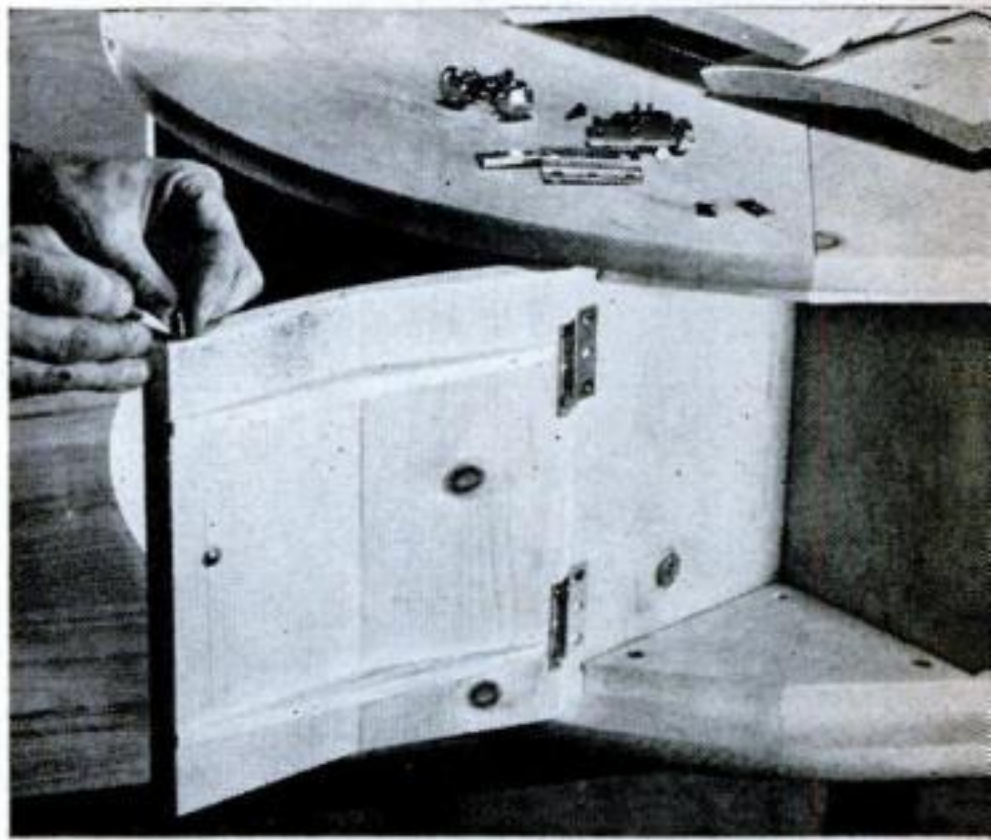
13. Table weight rests on a Chevrolet front-wheel inner bearing for easy turning. The column top and square table support are counter-bored for inner and outer bearing races.

14. Table support removed to show two parts of bearing. A through hole inside counterbore admits a 25" length of $\frac{3}{4}$ " pipe, which forms the shaft, as shown in following photos.

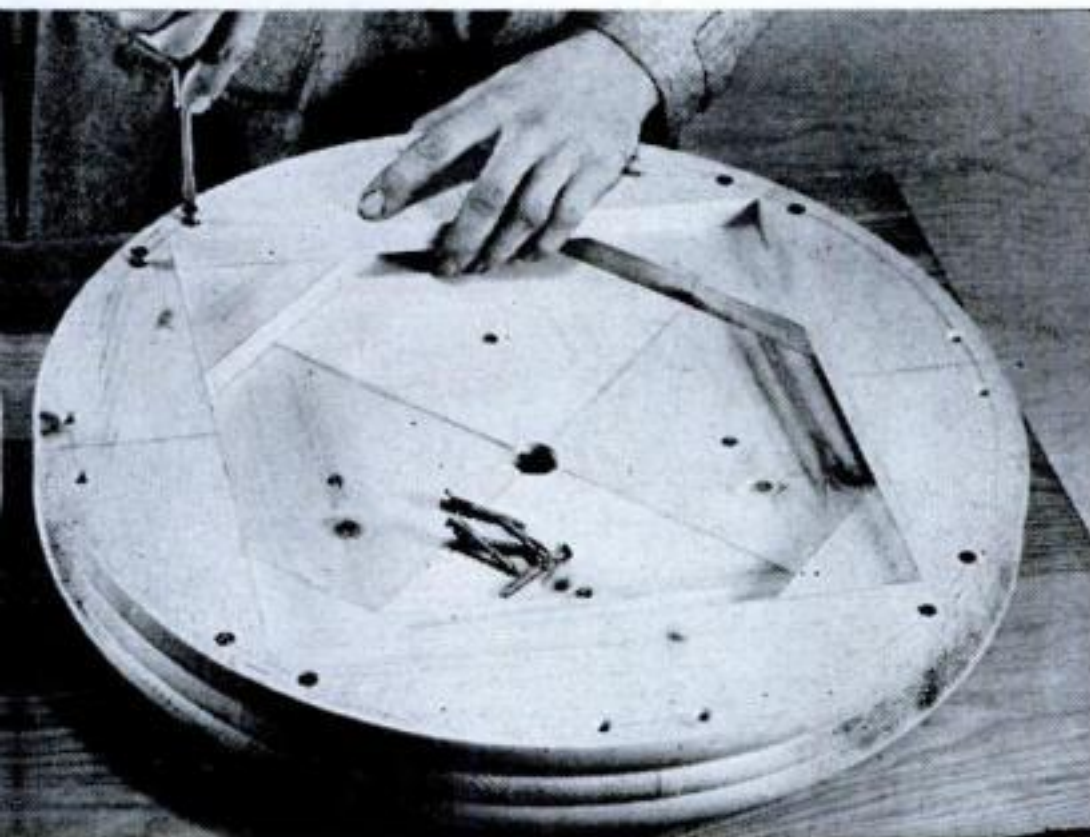




7. All back panels are cut the same size from hard composition board. Two fit channels in the box walls; other two are butted and bradded. Then top disk is attached with screws.



8. Doors are built up of two pieces joined with glue and a clamp nail driven into a kerf at top and bottom. Battens are set into dadoes. Hinge gains are cut in edges of door only.



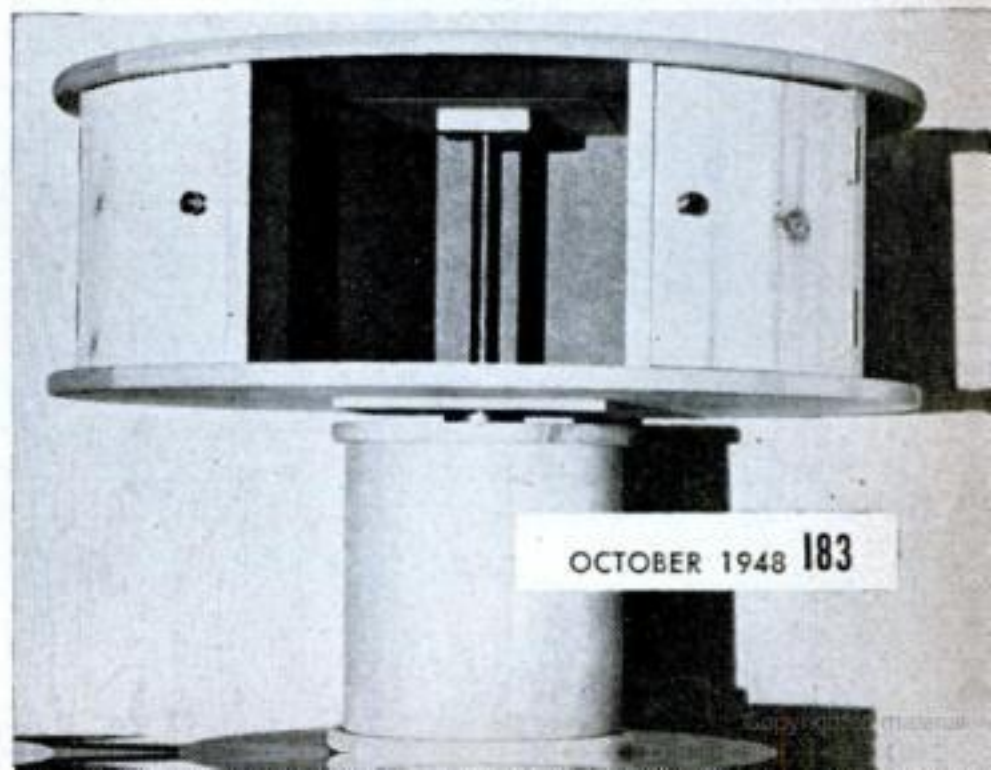
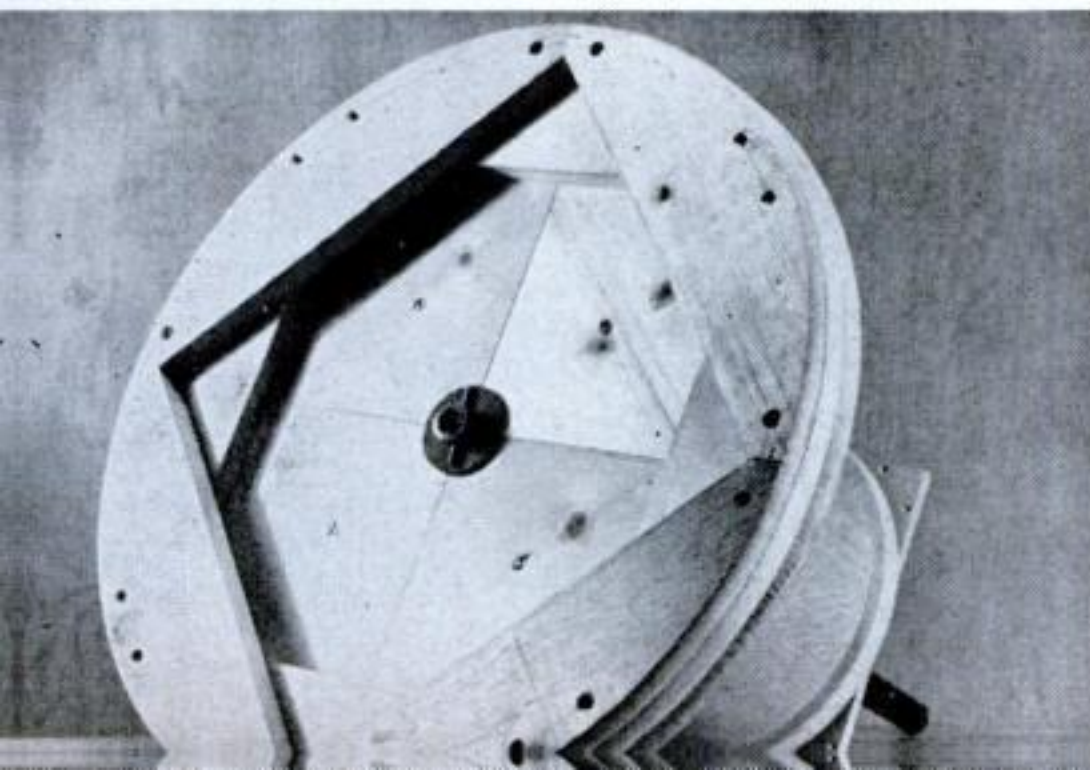
11. Assemble the base with the segment joints staggered one eighth of a turn as above. Use brads to locate the pieces thus, and then drive in 2" screws to hold them firmly together.

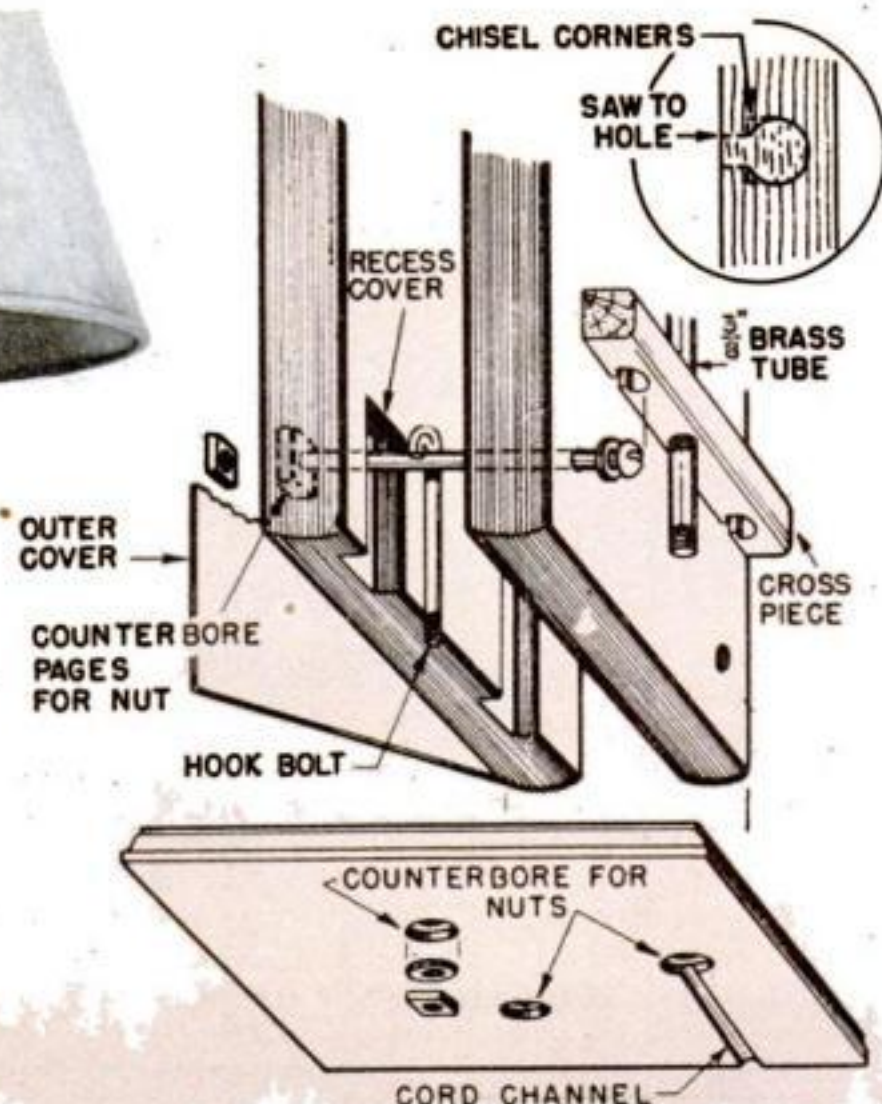
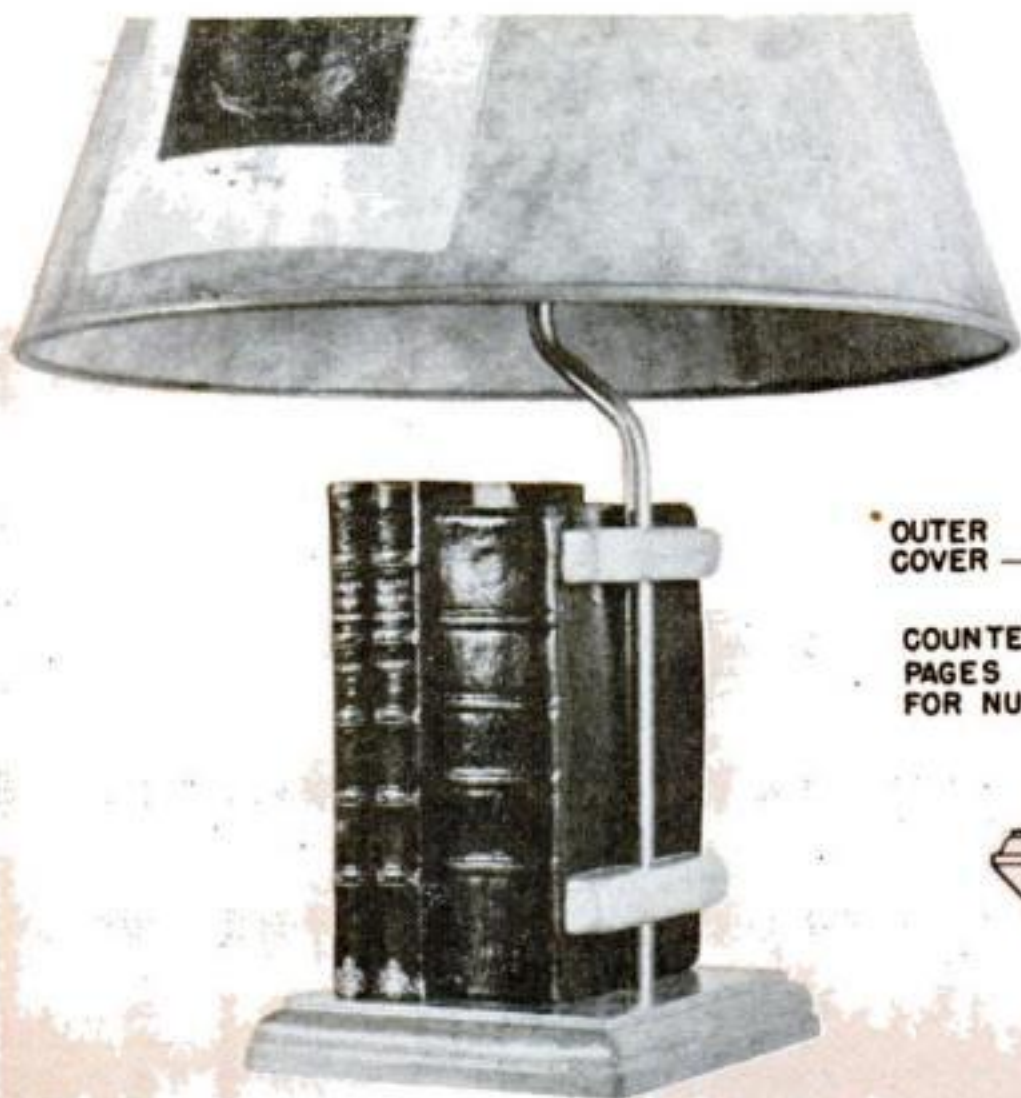


12. Bandsaw the column base and an identical cap, routing concentric grooves for the plywood column. Glue the column up with a cleat, rounded to proper radius, inside the joint.

15. Pipe shaft is secured beneath and also above the table support by composition-board washers and 3/16" pins. Note the four wood screws that hold column base to large base.

16. One compartment back has been removed to show interior. Top of shaft turns in hardwood block screwed to underside of top. This bearing prevents sway but carries no weight. **END**





This lamp combines the fine texture of leather bindings and the utility of a good reading light.

Library Lamp Built from Old Books *5464*

THE mellow luster of old leather contrasts quietly with the gleam of brass in this unusual library lamp. To make it, you'll need a few old books, bolts, some pieces of wood, and electrical parts.

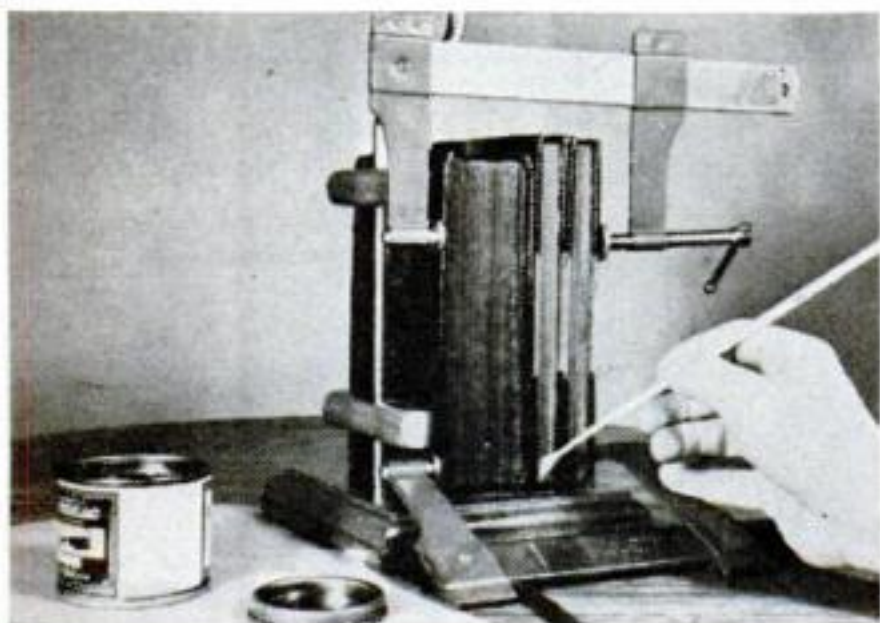
Select the books for attractive bindings, picking volumes that you won't mind gluing shut. If you can't dig up such books in the attic, try secondhand dealers. The bindings don't have to be in perfect condition, either,

just so the books are not falling to pieces. In fact, well-thumbed covers are more desirable than slick new ones.

Set the books as you want them. Then clamp together all except one cover and drill the four horizontal holes shown. Counterbore the outer pages for the four nuts. Use hardwood for the end bars—one that on finishing will contrast with the bindings. Drill a hole in each piece for the brass tube and shape two slots in each for the boltheads.

Bend the hook bolts from ordinary bolts with the heads sawed off. Cut two slots in one of the inside book covers to take the hook bolts as shown in the diagram. Then bolt the books together and glue the outer pages and cover together. Apply clamps.

Drill and counterbore the base for the bolts and tube, cut a channel for the cord, and bevel or chamfer the top edges. Shine the covers with boot polish and bolt them to the base. Then give both books and base numerous coats of clear lacquer, finishing off with fine steel wool. After wiring the lamp, glue a piece of felt to the base.—Walter Fischman, Philadelphia, Pa.



Keep books clamped until glue under outer cover dries. After lacquering, rub with steel wool.

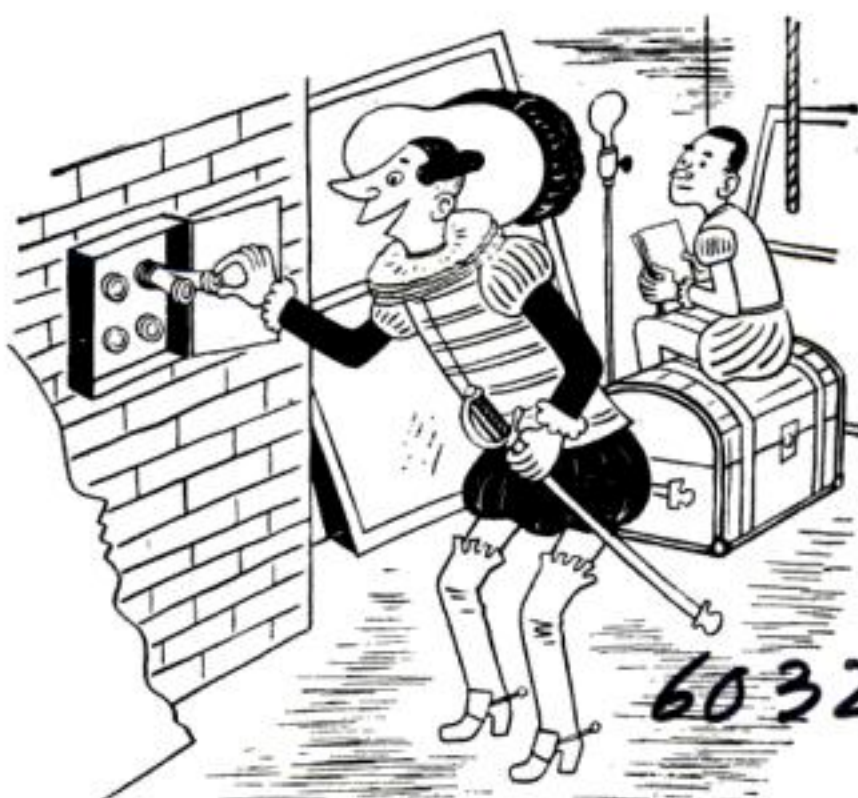
What's Your Ingenuity Quotient?



Eggs with corners aren't on any hen's laying schedule, so when I made egg sandwiches the hen fruit always hung out somewhere. Cutting the top edge off a coffee can, I shaped it like a slice of bread, with a short handle. This mold is put in the frying pan and the egg broken into it, sizzling to size.—*Elmer N. Gross, Portland, Oreg.*



Wet rag won't drag. Which kept me from my after-dinner cigarette when it was my turn to wash dishes. Panting for a smoke, I came up with this answer. Some wire from a clothes hanger is doubled and mounted with staples to swing from the wall. The outer ends, twisted, hold the cigarette. It stays dry.—*Robert F. Scott, Alameda, Calif.*

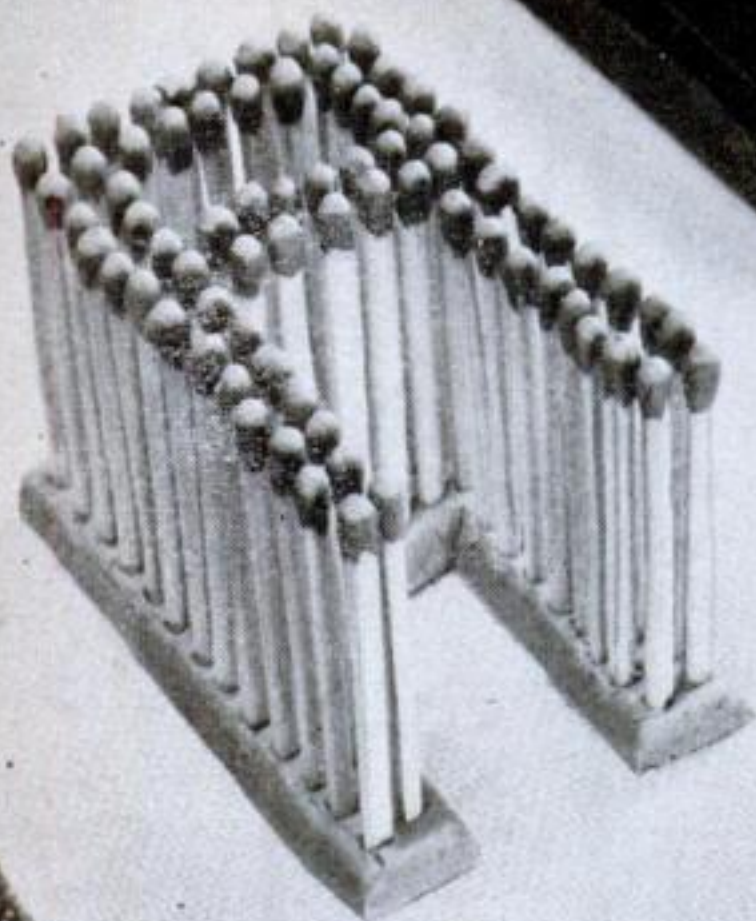


Ho! A fuse bloweth! With this cry, darkness fell on our school play before curtain time. Things looked black, for the circuit called for a 20-amp. fuse and we had nothing but tens. In a flash I screwed a 10-amp. fuse into each side of a double socket, and put it in the fuse box. On went the show.—*John Blackmer, Cambridge, Mass.*



I hate to get up to shut off the alarm clock, but if I don't, the racket wakes everybody else. To sleep those luxurious extra five minutes, I wound a cord around the alarm winding shaft, looped it around the other, and tied it to the shut-off. Now its jangle is short if not sweet, and I can snooze on.—*Graeme Mather, Vancouver, B. C.*

Have you pulled off a smart one lately? We will pay for acceptable contributions showing ingenious solutions of problems in the home, shop, garage, or camp. It doesn't matter if it's wacky—if it works. Use government postcards only. Contributions cannot be acknowledged or returned.



Clay is handy as a holder for many things. Cut a piece in the shape of your initial and use it as a match holder. Mold a ball of it into the bottom of a bowl or vase and stick flower stems into it, or form smaller pieces into shapes for party place-card holders.

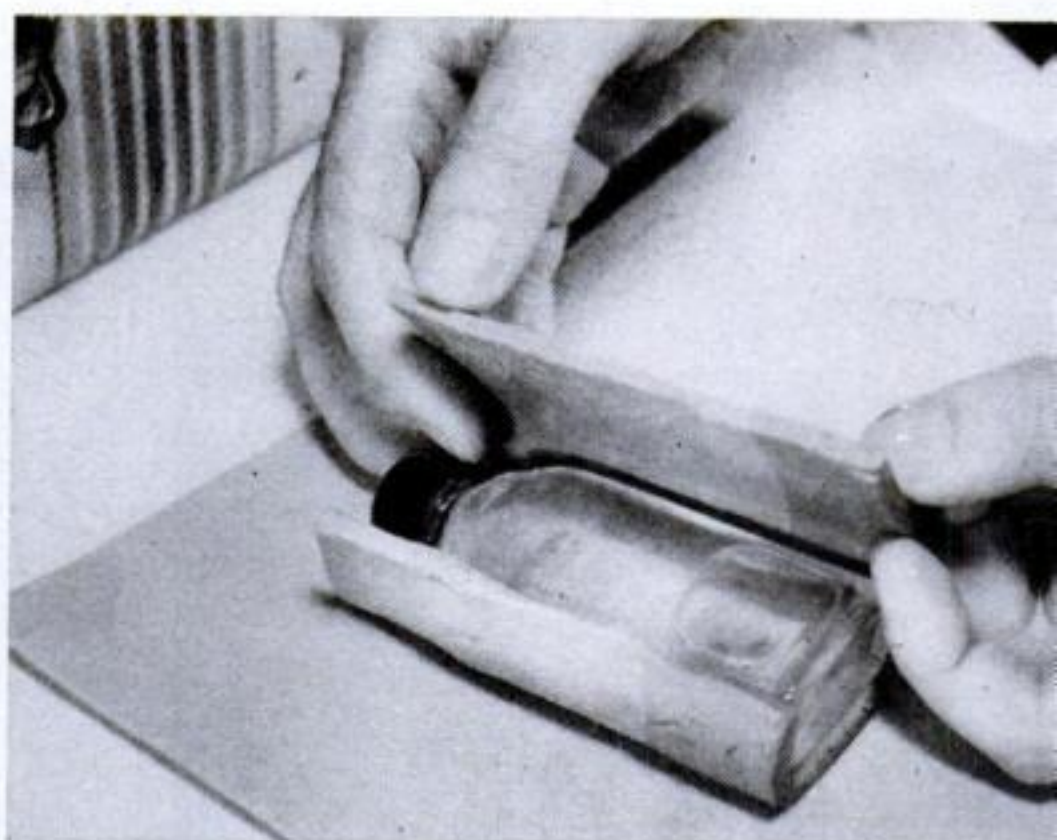
Ten Extra Uses for 3469 Modeling Clay

MODELING clay, the nonhardening type, has dozens of uses around the home and shop. In addition to the ones illustrated on these pages, here are some others:

Since clay tends to pick up dirt and grease, you can clean a lot of things with it, including tools and typewriter type. If a candle wobbles in its holder, fill out the extra space with a ring of clay. Fishermen can use it, too, by sticking hooks into a wad of it. The clay keeps rust from the hooks and the hooks from your fingers. And on the end of a stick it will pick up small objects dropped in tight places.



Here's a neat dodge to help keep your fingernails clean when painting or working around the car or furnace: Put a bit of clay under each nail. When the job's done, press a small ball of clay against the end of each finger. The ball picks up the other clay and dirt.



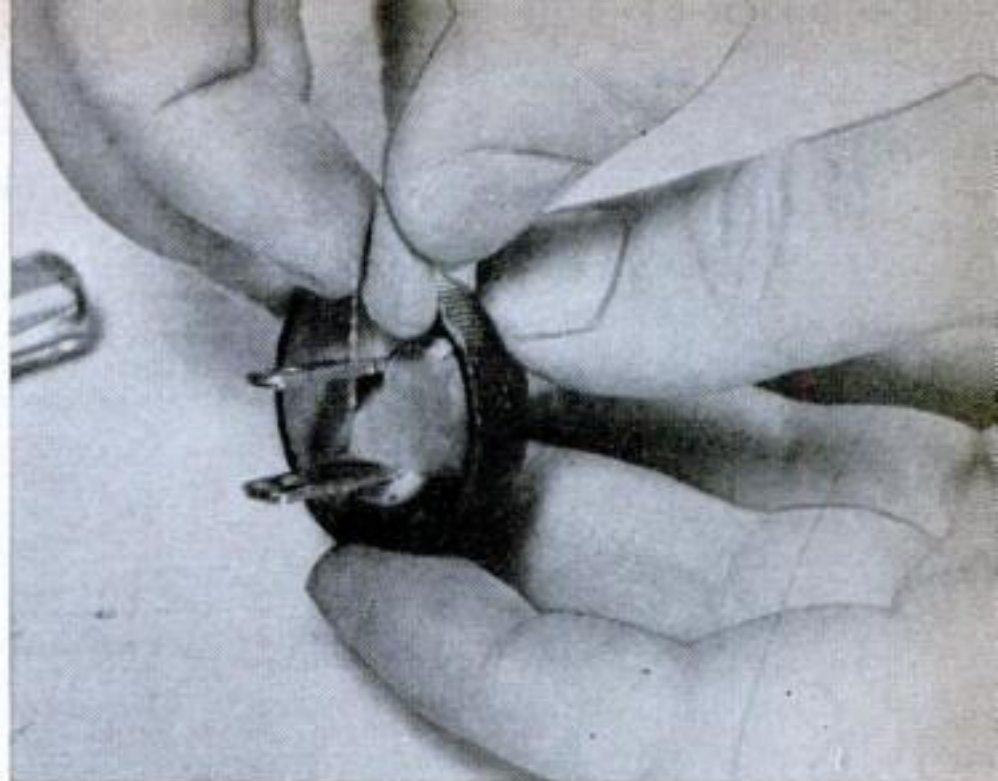
Small, fragile bottles of perfume or medicine may safely be mailed or carried in a suitcase if you'll first wrap them in a slab of clay. Wrap clay and all in paper before putting the bottles in a bag. Protect valuable chinaware or small vases for shipping in the same way.

When working with screws, nails, or other small objects atop a stepladder, stick them in a block of clay. The block is less likely to be knocked over than a can or ash tray; it keeps the items separated; and it acts as a lubricant when you drive home screws or nails.

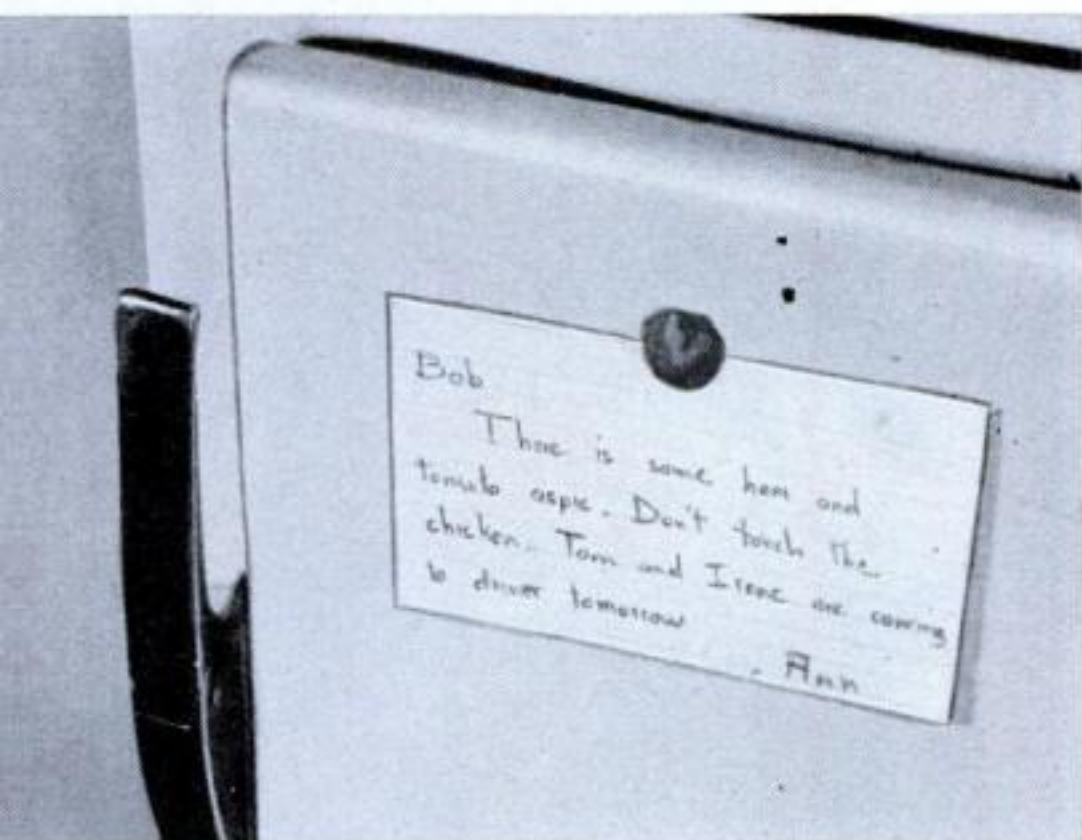




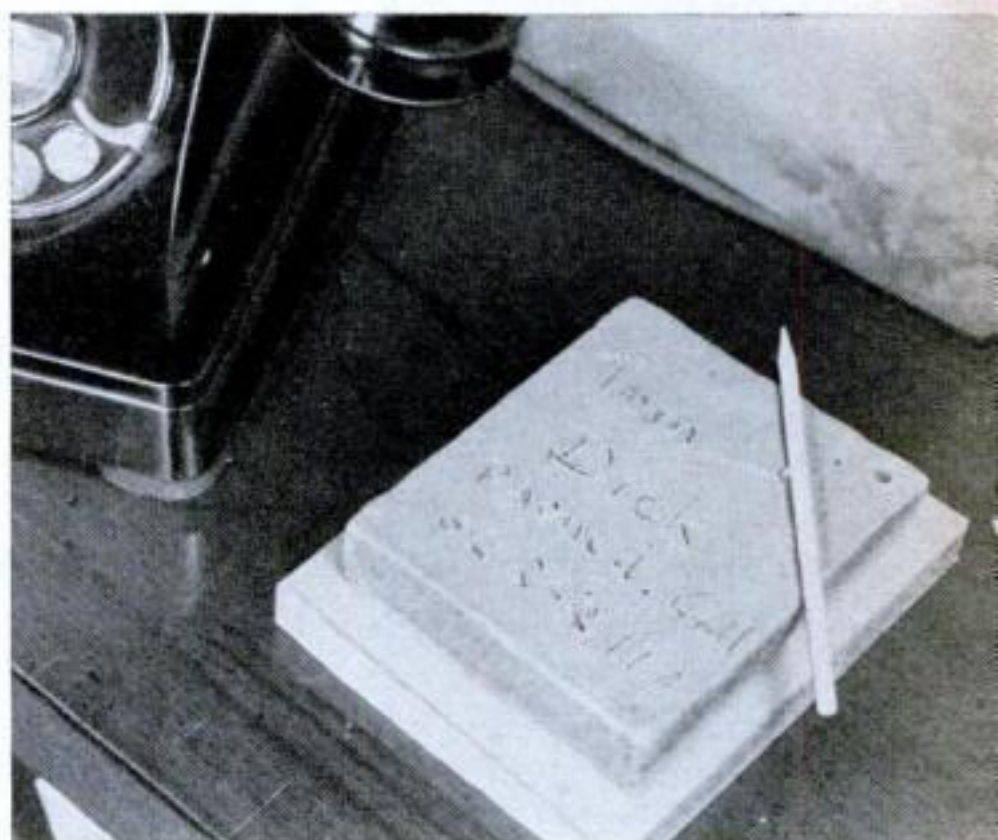
While the cement on mended china, glassware, or pottery is setting, dabs of clay will hold the pieces firmly in place. Use clay to fill in chips on decorative pieces—those not used for food—and then shellac over it, or paint the spot to match the color of the piece.



There are many spots for clay around electrical fixtures. When working close to switches or junction boxes that must be kept "hot," it makes a temporary insulator. Put a wad of it over the exposed wire ends or screws. You can also pack it in cord plugs to avoid shorts.



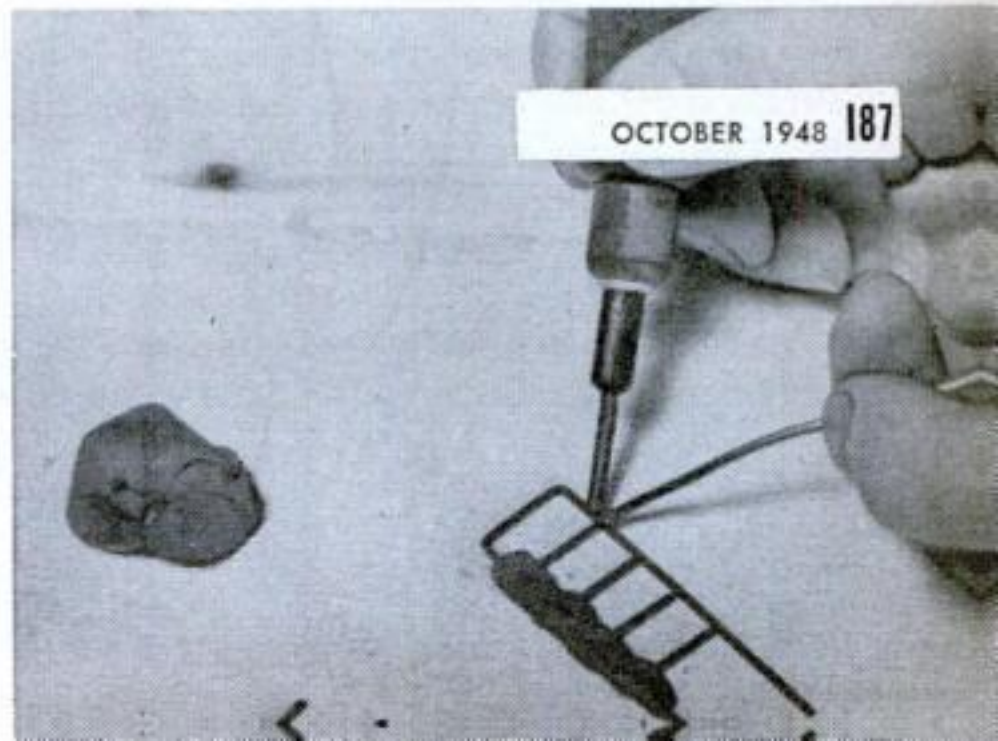
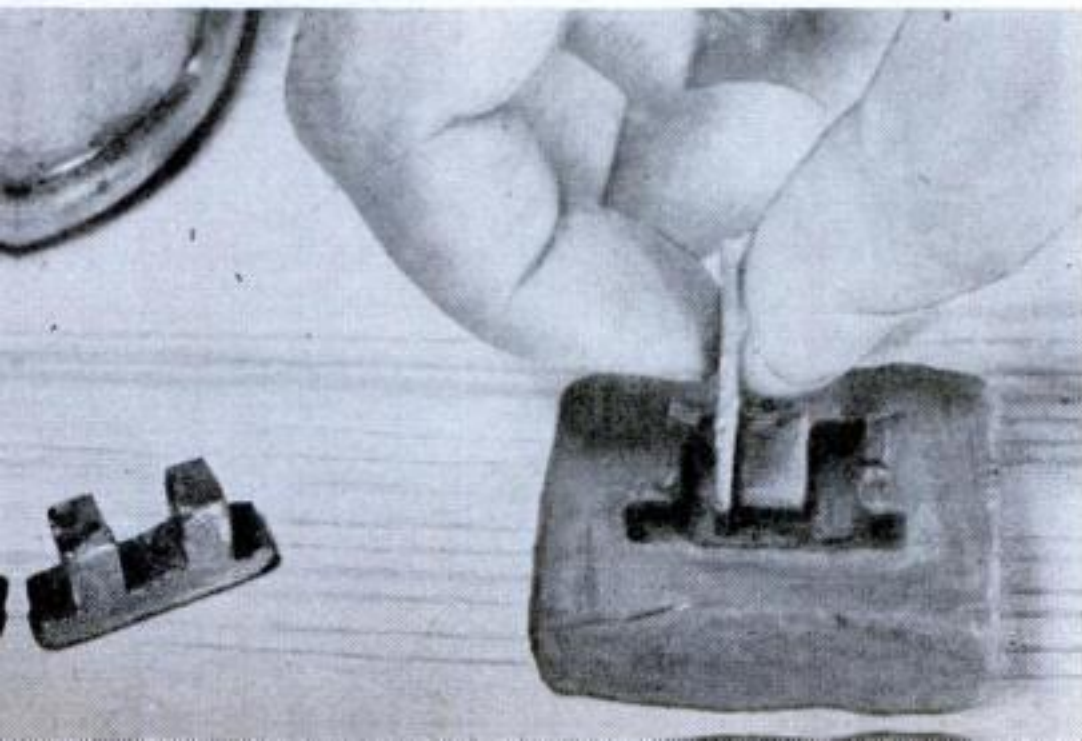
Clay will stick to almost anything until you pull it off, so it's ideal for holding pin-up notes. But don't use it on wallpaper because it may leave a grease spot. However, you can put it on refrigerator or other metal doors, window panes, and wooden doors.



This one is for doodlers. Roll out a pad of clay, mount it centrally on a larger piece of wood or cardboard, and place it and a pointed stick by the telephone. Then you can scrawl out your usual designs—or even an actual message—and erase by running your thumb over it.

Small molds of clay are fine for making small castings of type metal or solder. To get best results, mix a little sand or earth with the clay. If you have one part and want to duplicate it, roll out a block of clay and press the part into it to form the mold.

Modelmakers find lots of jobs for clay. It helps a lot when soldering up ladders or ship railings, for example, as well as many other small parts. Use clay to locate and hold the pieces in place while you solder. This leaves both hands free and permits cleaner work.

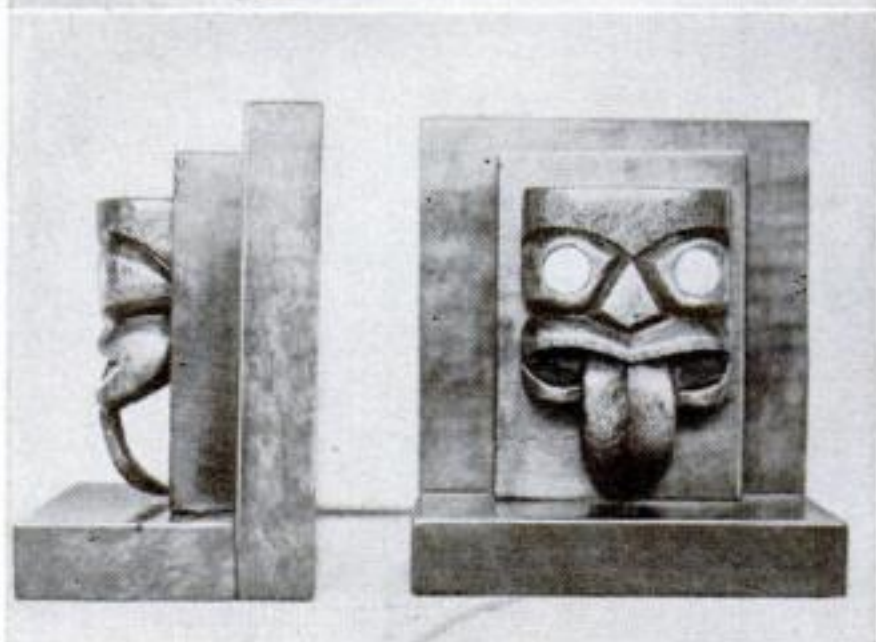


Carved Maori Book Ends

PATTERNED after the ugly-handsome carvings of the Maoris and other Polynesian peoples, these home-carved book ends make a rewarding, not-too-difficult project. I used Spanish cedar, which carves and finishes beautifully, but any other free-carving wood would do.

For the full-length figure, I used 1" by 3¼" by 6½" pieces, roughing them out with a coping saw and then finishing with a knife and carving chisels. I cut holes for the inset eyes by twisting a sharpened .50-cal. cartridge case into the wood for ⅜", though a wood bit will serve. The eyes are jigsawed from a sea shell, using a fine-toothed blade, and dressed on a grindstone for a snug fit. Don't cement them in until carving and finishing are complete. The book-end bases are hollowed for sheet lead weighting, and felt-covered beneath.

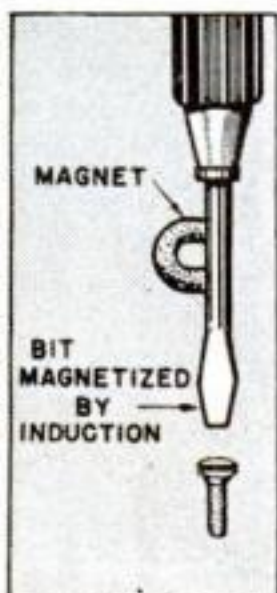
I got a good finish on the cedar with several coats of orange shellac, rubbed down with steel wool and topped off with dark-brown shoe wax. Deep cuts should be dark, and the upper surfaces smooth and glossy.—*Lloyd Culver, Fullerton, Calif.*



A smaller, simpler version of the book ends is shown directly above. The carved head is glued and screwed to larger blocks. A coping saw cuts away the waste stock from behind the tongue.

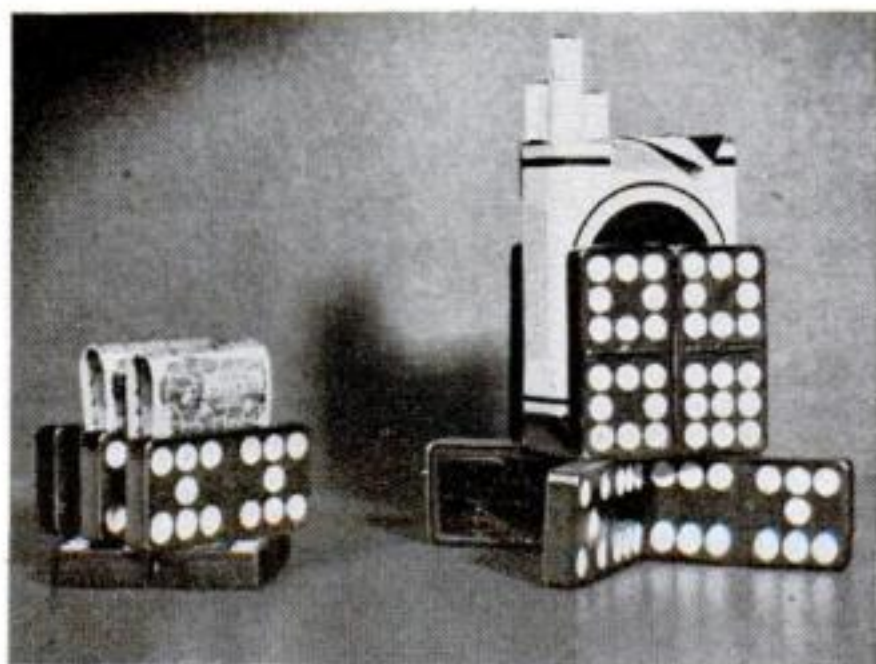
Induced Magnetism Holds Nut

NEXT time you need to secure a nut or screw to a tool in cramped quarters, try this dodge. A fairly strong permanent magnet will afford ample induced magnetism. With some steel or iron wire substituted for the tool, the same idea is good for fishing out dropped washers or nuts.—*Thomas Loughary, Portland, Ore.*



Dominoes as Table Accessories

NOVELTY smoking accessories for the card table may be devised from ordinary dominoes. Very easy to make, they are assembled merely by sanding the meeting surfaces and then cementing under light clamp pressure. Light brads could be employed but usually aren't needed. The match holder consists of three vertical pieces on a two-piece base; the cigarette holder uses a base of four dominoes supporting a bracket of five. Spots may be arranged to give a pattern.—*Frank Shore, Manhattan, N. Y.*



or fine ^{5/12} enameled wire, same gauge.

Mystery Lamp

LOOK! No wires. However, it only looks that way. The gimmick is two fine, almost invisible wires that run up the edges of the clear plastic from the base and into the socket support.

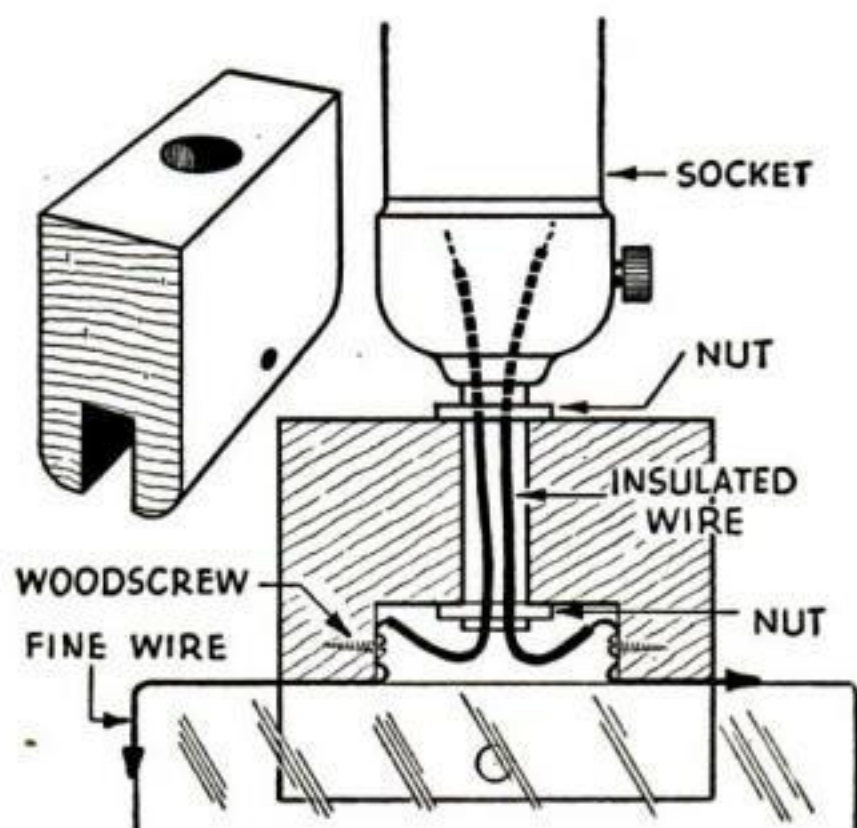
Although the dimensions aren't critical, here are the ones for the lamp I built: Plastic, $\frac{3}{8}$ " by $4\frac{1}{2}$ " by 7"; oak base, $\frac{3}{8}$ " by 4" by 6"; oak socket support, $1\frac{1}{4}$ " by 2" square. I used .006" Nichrome [®] wire on the edges of the plastic, but equally fine copper wire will do as well.

Cut a $\frac{3}{8}$ " deep slot in the collar to fit snugly over the plastic. Then drill it through the center for the nipple and counterbore for the lower nut. With a chisel, enlarge the counterbore for the wood screws to which the wires are attached. Make sure the screw heads do not touch the nut and cause a short. Chisel a groove in the base to take the plastic tightly. Then sand, stain, and polish both oak pieces.

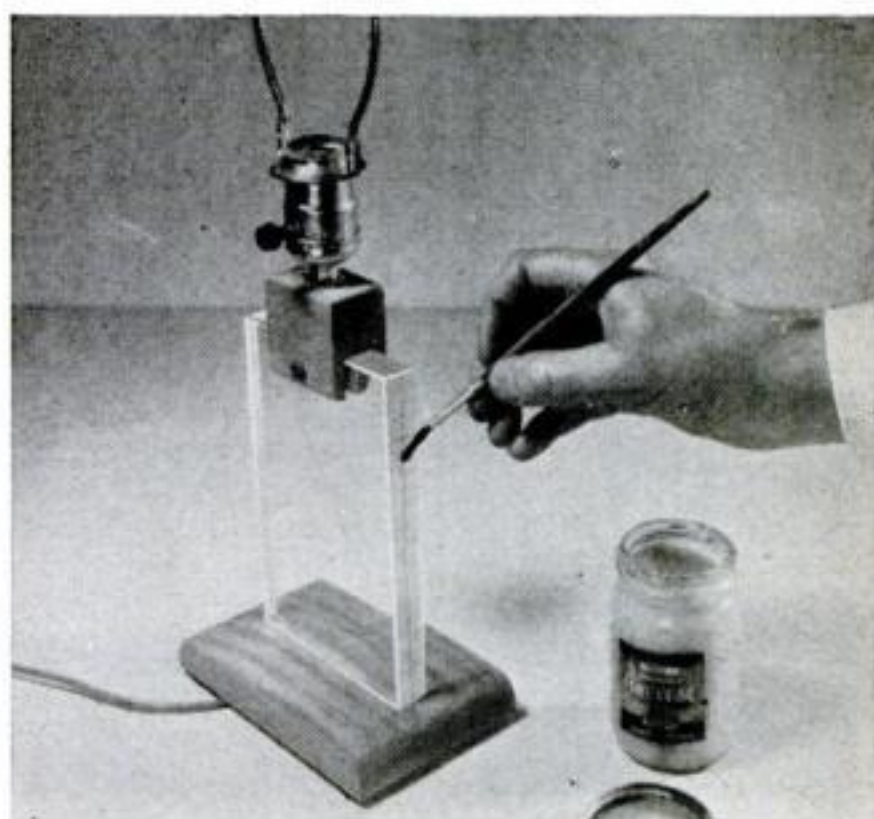
Wire the socket first, using insulated wire as far as the wood screws. Then connect the fine wire, running it down the edges of the plastic and through the base, where it joins the lamp cord at two more wood screws. Four small rubber feet fitted to the base raise it enough to clear the cord.—William Norton, Manhattan, N. Y.



Almost invisible wires carry current from the base to the bulb. The .006" wire is capable of carrying current for bulbs up to 60 watts without overheating. Avoid bigger bulbs.



When wiring the lamp, be sure to allow enough space between each wood screw and the nut at the base of the nipple. If both screws should touch the nut, a short will result.



Insulate the exposed wires along the plastic by brushing on shellac, followed when dry by a coat of cement. Transparent fingernail polish may serve equally well.

What to Do About Plywood Edges

Glenn F. Wagner, 51 Winne Road
Delmar, N.Y.

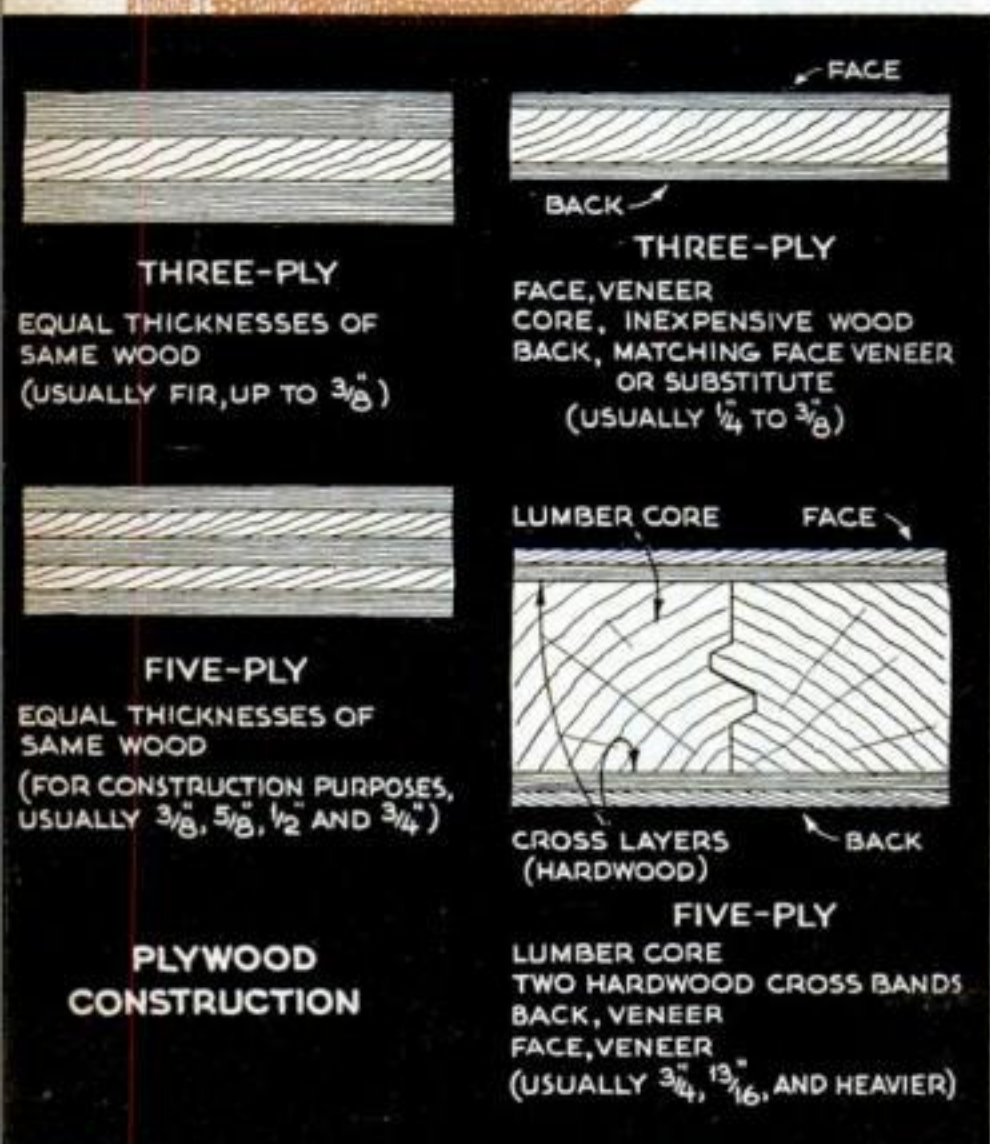
WHEN the home carpenter or furniture builder first discovers plywood, he's apt to wax pretty enthusiastic.

"Wonderful stuff!" he's likely to say. "Strong as iron, but a breeze to cut. Doesn't warp much. Pretty, too—there's nothing nicer than those hardwood veneers. And you can get it in panels—none of that business of gluing up small boards."

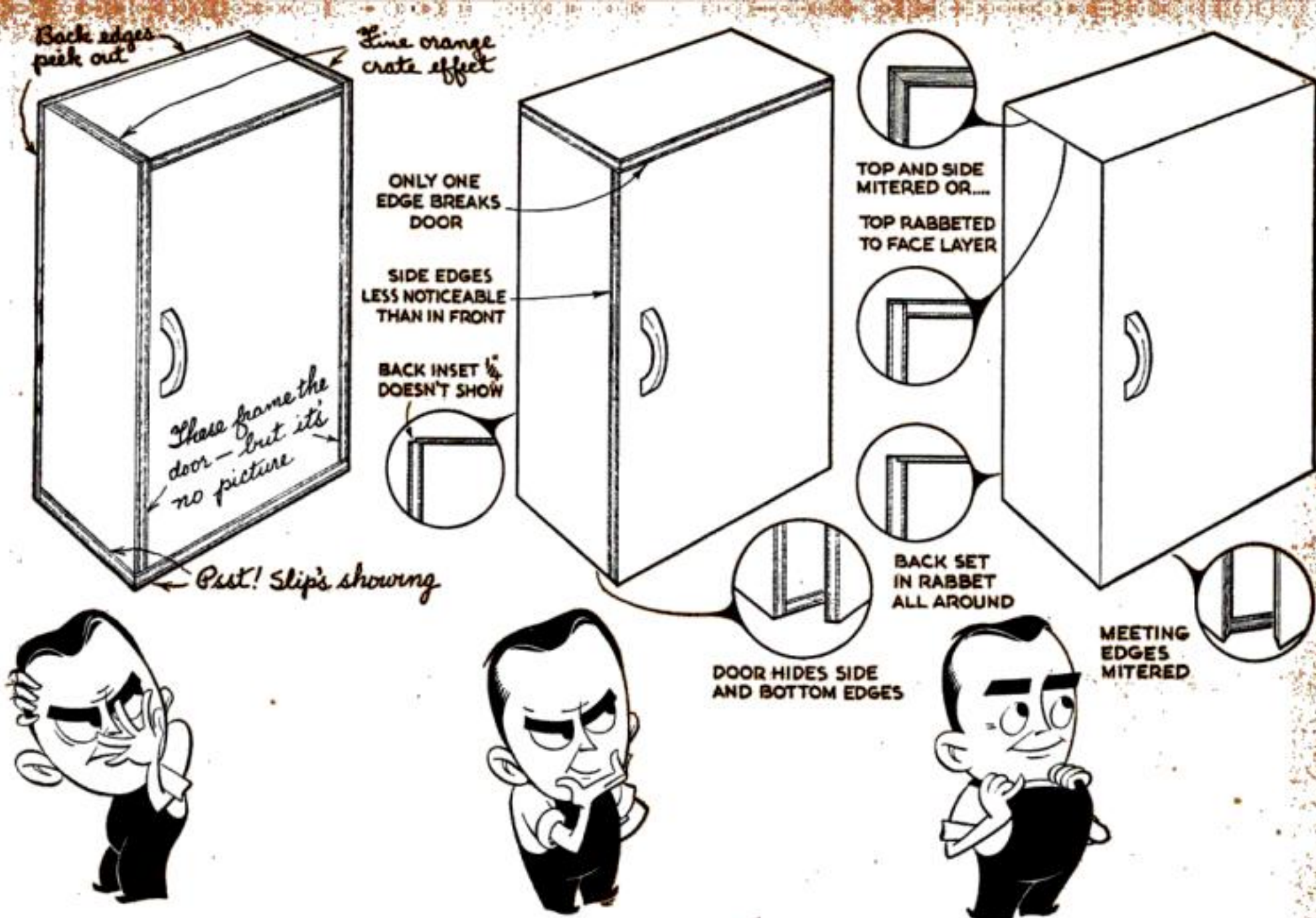
But before long he runs hard aground on the problem of finishing off plywood edges. His first jobs are banded with raw edges that resemble half-healed scars. And his enthusiasm usually gives way to discouragement.

Of course plywood edges *are* a problem in home furniture-making. But plenty can be done about it. Here are some basic edge-handling techniques, and if you're worth your weight in sawdust, you'll be able to think of others.

First, check the design of the piece you plan to build. Even with plain butt joints, there are an astonishing number of ways to assemble a simple box, and each one makes a difference in the number and position of visible edges. If your equipment will make rabbets and miters, a little pencil-chewing at the design stage will cut the edge problem way down. Ponder, too, where the piece of furniture will be located, what surfaces will



Types of plywood vary widely, having different construction, woods, thicknesses, and bonding agents. The hardwood veneers are generally best for furniture that's to have a wood finish.



be exposed, and what finish you will use.

For an example of what design alone can do, study the drawings at the top of this page. Nobody who got through Manual Training 1 is apt to commit the criminal cabinetry sketched at the left above; but it's surprising how often even old hands will miss a chance to tuck one or two edges out of sight. Of course, you shouldn't sacrifice strength or other desirable characteristics. For instance, don't rabbet a veneered side-piece to receive a door—it may look fine, but the thin, unprotected lip won't last long.

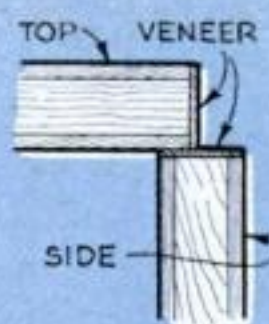
Once you've reduced the number of edges, figure out the best treatment for those remaining. Sometimes you can bead the edge itself; more often you'll want to glue beading or molding on it. A mitered framing strip, secured by glue and brads that have been set and puttied, is a very effective treatment, especially for table and desk tops. Shaped molding, either bought or made up in the shop, is also fine on, for example, the exposed shelf edges in a bookcase. Don't overlook common half- or quarter-round molding; and don't forget that molding width needn't equal edge width to look all right.

Edge treatment depends a good deal on what you're building. If it's to be a handsome, modern-styled radio cabinet or coffee



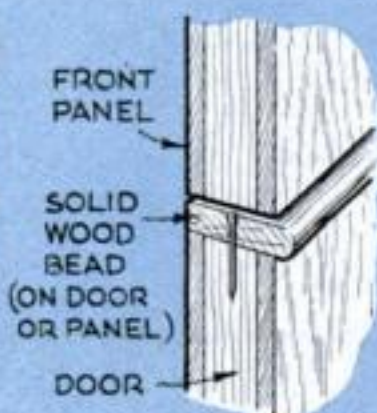
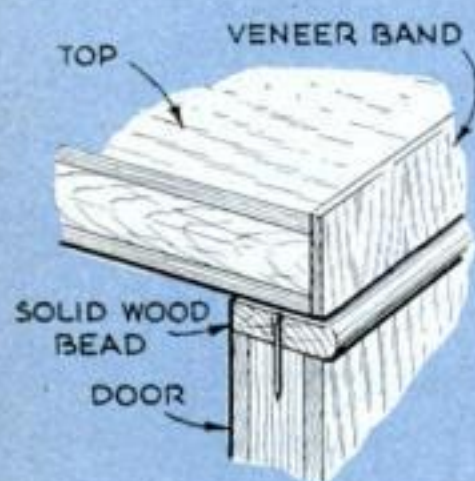
HORIZONTAL OR VERTICAL VENEER BAND

SAME AS FACE OR CONTRASTING.
APPLIED AFTER PANEL IS CUT



VERTICAL BAND ON EDGE

VENEER EDGES



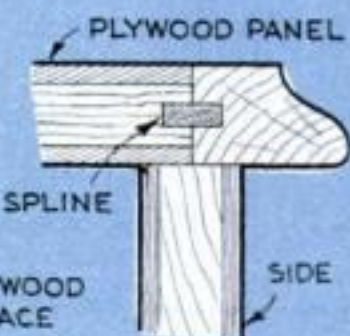
DOOR EDGES



WOOD BATTENS



TABLE AND SHELF EDGES

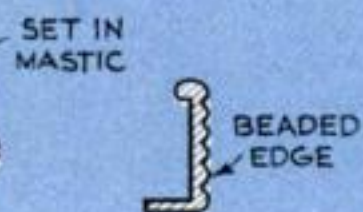
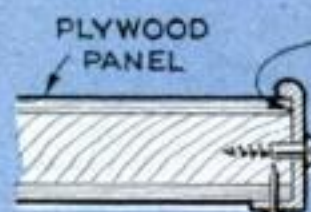


MOLDED EDGE

APPLYING WOOD STRIPS



METAL LOCK STRIPS



EXTRUDED EDGING

USING BATTENS OR EDGING

table, veneer strips are probably the answer. Selected to match or contrast with the facing, veneer is the de-luxe edge covering. But if you're doing a job nearer carpentry than cabinet-making—say, wall paneling or kitchen closets—battens, molding, or metal edging will do the trick.

Sometimes neither avoidance nor concealment seems just right. If the piece is to be painted or stained dark, just fill the edges with plastic composition wood and sand

thoroughly. If you have a power sander, another dodge is to burn the edges deliberately by sanding so hard the wood discolors. This gives a hard, glazed finish that takes paint nicely and is even attractive by itself. If you're using lumber-core plywood, remember that the basswood or poplar core will take a good oil or stain-wax finish itself. Try out different finishes on a piece of scrap; often you can get an effect that'll blend nicely with the face veneer. END

2480

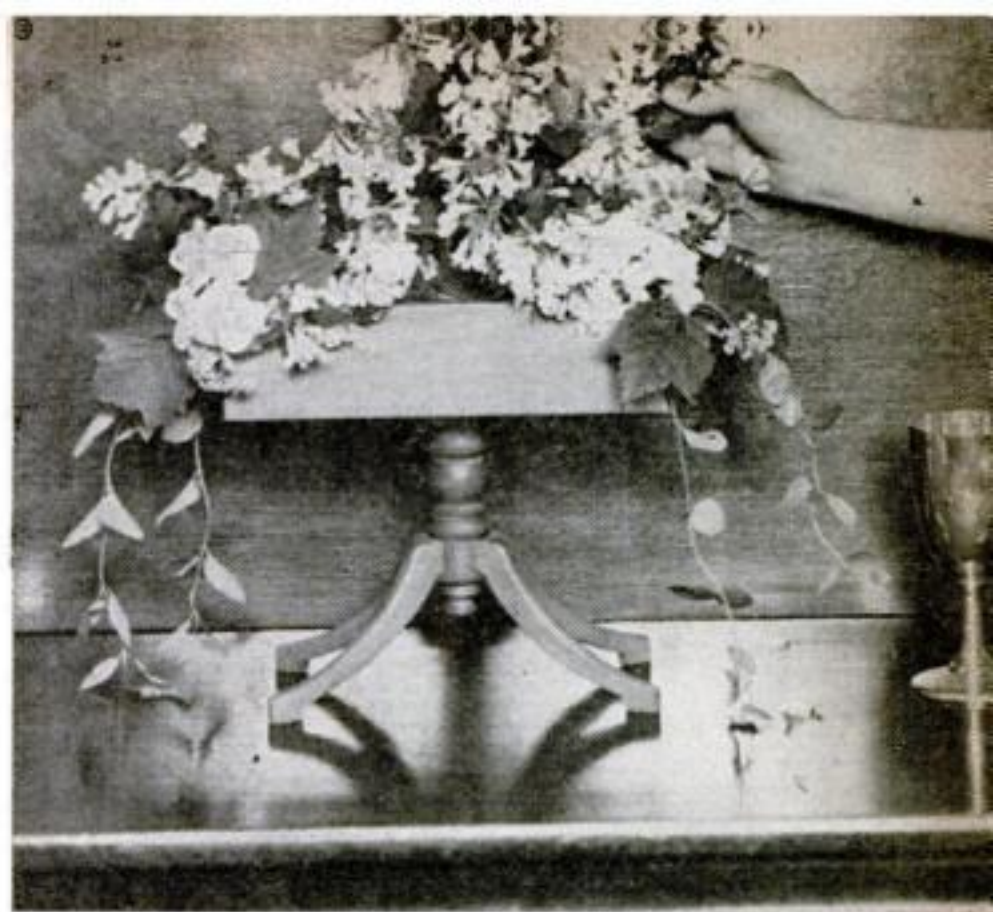
Colonial Plant Stand Scaled to Table Size

SOME unknown 18th Century craftsman originated this design, perhaps as a plant stand or sewing box. It was discovered in the form of a miniature in the South. The model was one fourth the size of the little plant holder in these photographs; that is, its dimensions were doubled to make the project shown. By increasing them still more, you'd have a full-size piece for the living room. The middle compartment might be fitted with a hinged lid.

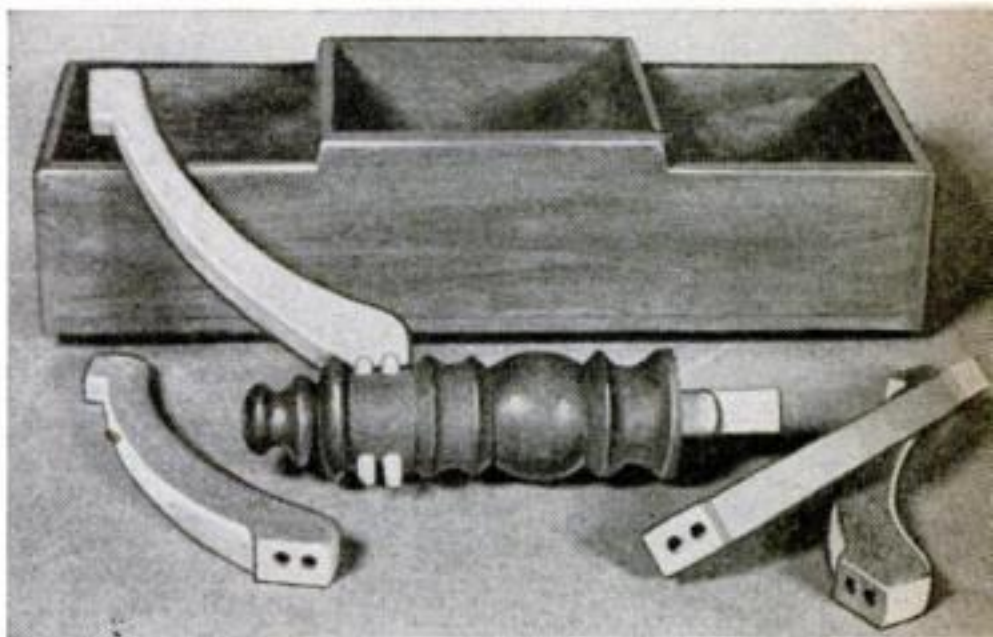
Mahogany was used for the table-size project here. If your lathe has an indexing head, lay out the leg locations while the column is still between centers. Kerf the tenon for a wedge to lock it in the hole.

Since the legs taper in thickness, they're laborious to make by ordinary means. A good way is to lay out the leg profile on a block of wood with the grain lengthwise, cutting foot and shoulder lines at 45 deg. The circular-saw miter gauge is set for half the required taper angle. The first cut is waste; the stock is turned upside down, and a second cut gives a true wedge. Again the stock is flipped over for the second wedge, and so on. Draw the leg outline on the pieces with a template and jigsaw to shape. The shoulder surface can be curved to fit the column on a 1" sanding drum.

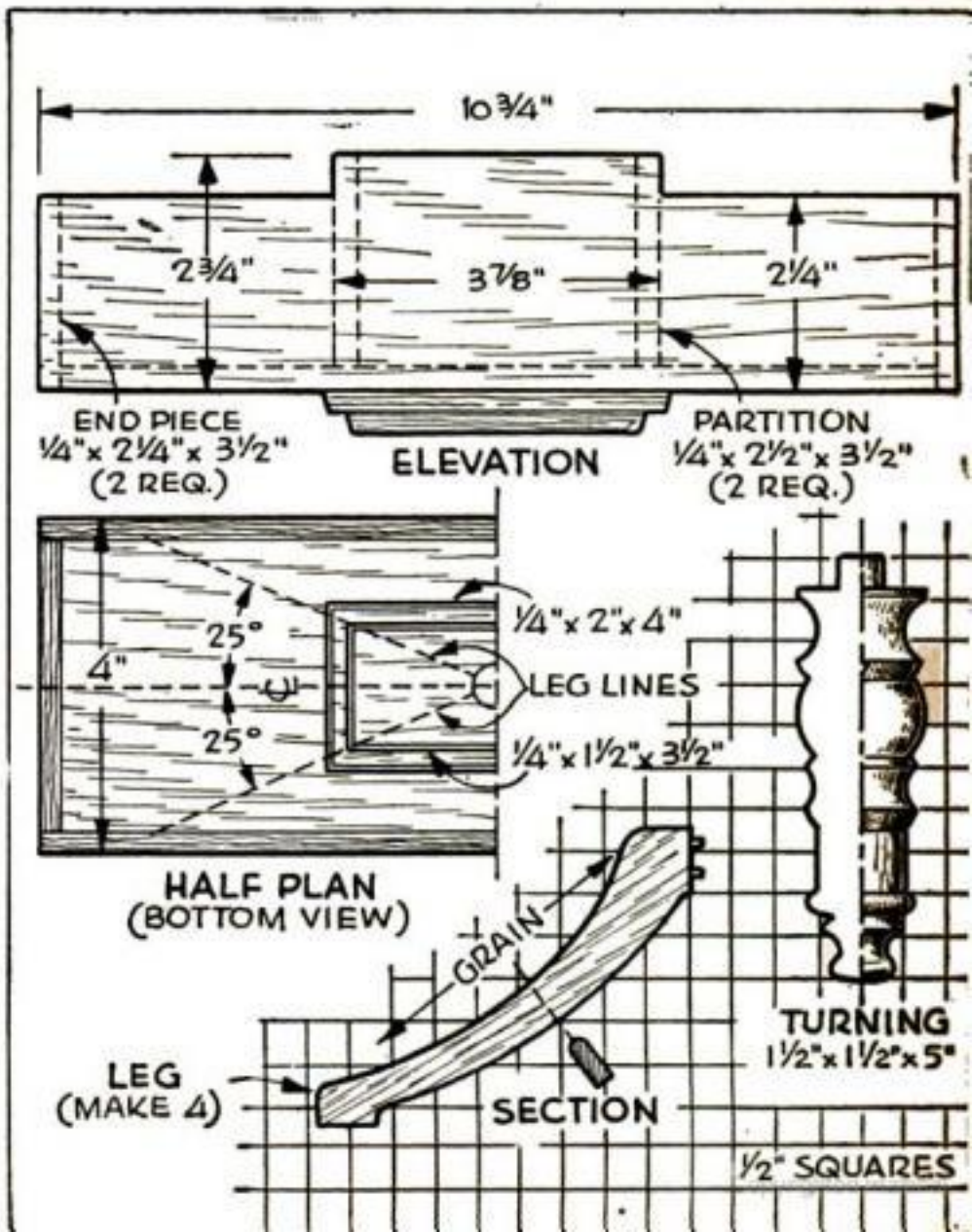
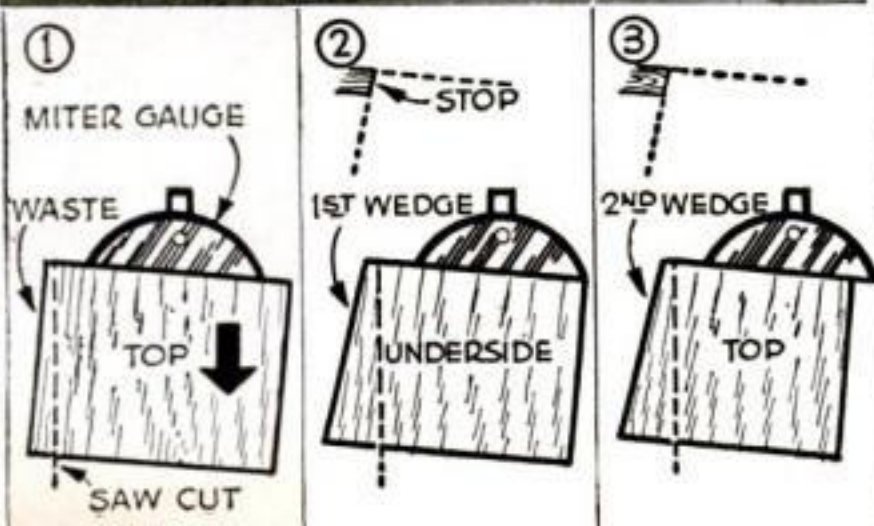
The box body is assembled with glue and brads, set and puttied over. For living plants, waterproof liners should be fitted.—*John P. Arnold, Doylestown, Pa.*



Flower arrangements are displayed attractively in this table-size model of an 18th Century design. Scaled up to full size, it will make a handsome piece of furniture for the home.



Box has three compartments, which should be fitted with copper liners if meant to hold living plants. Note that legs taper in thickness and are doweled to the turned column.



Checking Up on Radiator Valves



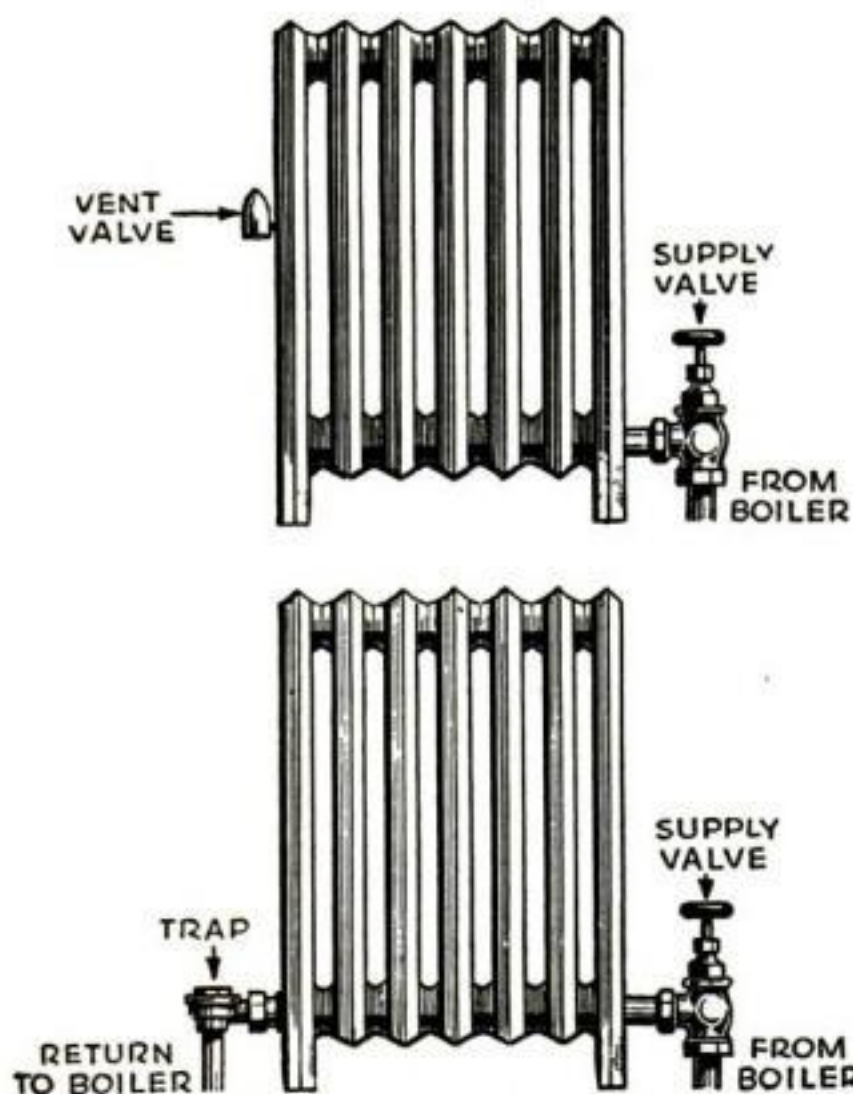
Dirt is a frequent cause of faulty radiator-valve performance. An annual cleaning, along with a check for worn parts, is a step toward troublefree heating during the winter.

THIS is the time—before cold weather really sets in—to check radiator valves. It's easy to clean them and replace faulty parts. You'll be repaid with quicker and better heat plus a fuel saving.

Radiators in the average steam-heated home have two of three kinds of valves, depending on whether it's a one- or two-pipe system. In either case, there'll be a supply valve on each radiator. On a one-pipe system, the radiators are fitted with vent valves, and on a two-pipe setup, traps replace vents.

An air vent is the little gadget on the end of a radiator that sizzles when steam is coming up. Other than cleaning, there's not much you can do with these. Most of those in use today are sealed at the factory and cannot be taken apart. The vents let the air out of the mains and radiators as steam rises, but shut off immediately when steam or water reaches them.

Here is how most air vents work: The



Most steam-heated homes have one of the two systems shown here. In the one-pipe setup the water drains from the radiator through the supply valve; in the other, through the trap.

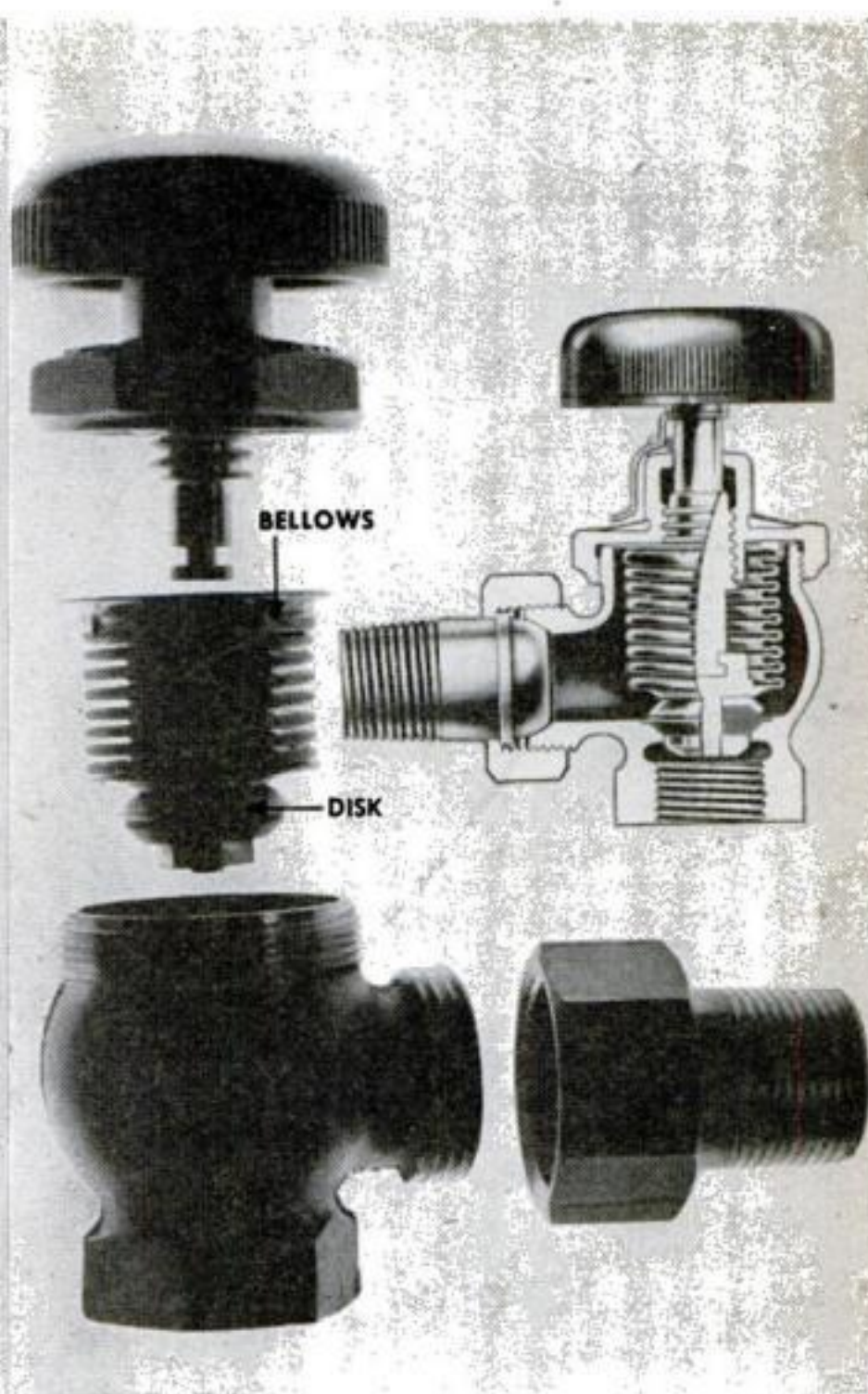


Shown here in exploded and sectional views are a trap, left, and a packless supply valve. In operation, the trap remains wide open as steam forces air out of the radiator. Water also passes

needle, which moves into the seat to close the valve, is connected to a float that is also a thermostatic element. The bottom of this element is a flexible diaphragm that rests on a base. Inside the thermostatic float is a volatile liquid, usually a mixture of alcohol and water.

As steam rises from the boiler, shoving air ahead of it, the vent remains open to pass the air. When steam hits the thermostatic element, the volatile liquid vaporizes. This expands the diaphragm against the base, pushing the needle into the seat to close the valve.

Vents are also built to close against water. The float takes care of this, rising with the water and shutting the valve. However, it must reopen to resume venting as soon as the water has drained back into the radiator. To do this, the vent is fitted with a siphon or metal tongue that routes the water out of the valve.



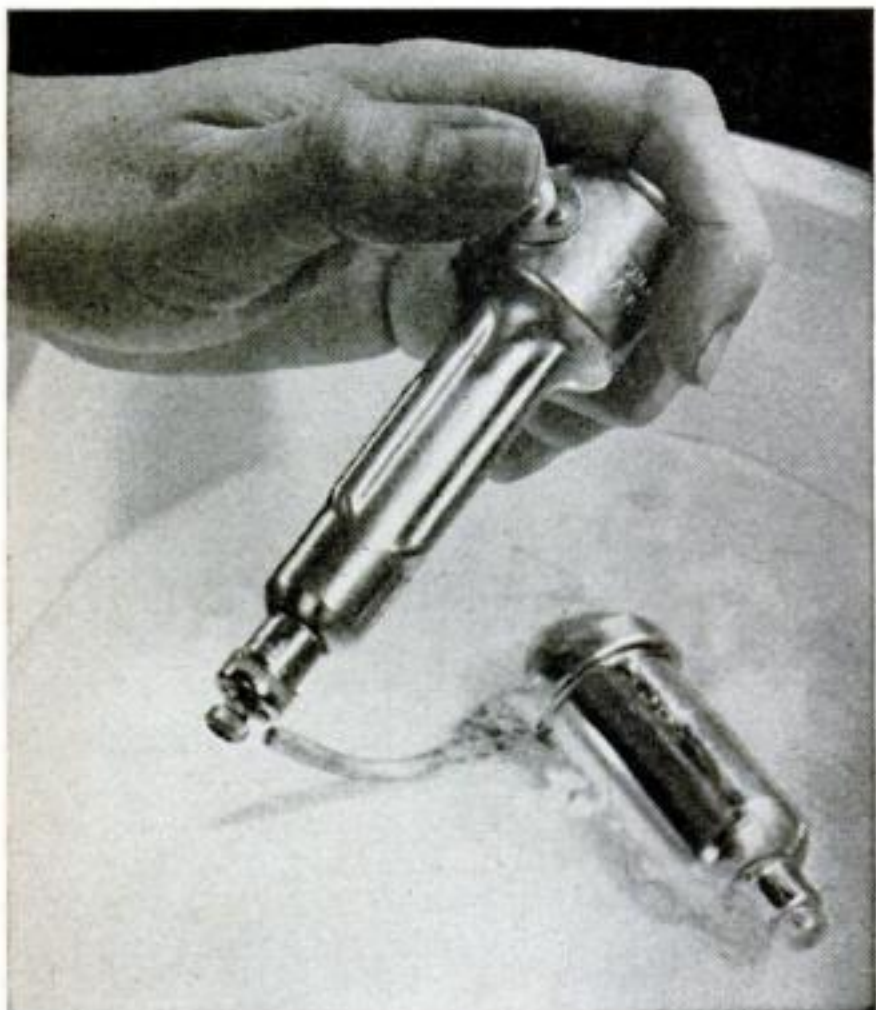
out through the trap, but when the much hotter steam reaches it, the bellows expands, closing the trap. The bellows, head, seat, and disk are replaceable in most valves and traps.

Dirt is a frequent cause of trouble in a vent valve, making it stick open and letting it pass steam or water. Clean the vents by soaking them in warm, soapy water. Use a good strong soap or one of the commercial valve-cleaning compounds. When the vent is filled with the soapy water, close the opening with your fingers and shake it well. Finally, rinse the valve in clean water.

Don't use an acid in cleaning any of the valves, and don't poke sharp instruments into the openings of vent valves. This may puncture the element, ruining the valve.

Supply valves and traps also pick up dirt in the form of slime and sediment. With a few wrenches, you can remove these valves from the radiator and take them apart for cleaning. Kerosene, or soap and water, is good here, along with an old toothbrush or any small, stiff-bristle brush.

A trap functions much like a vent, except that it passes both air and water out of the ra-



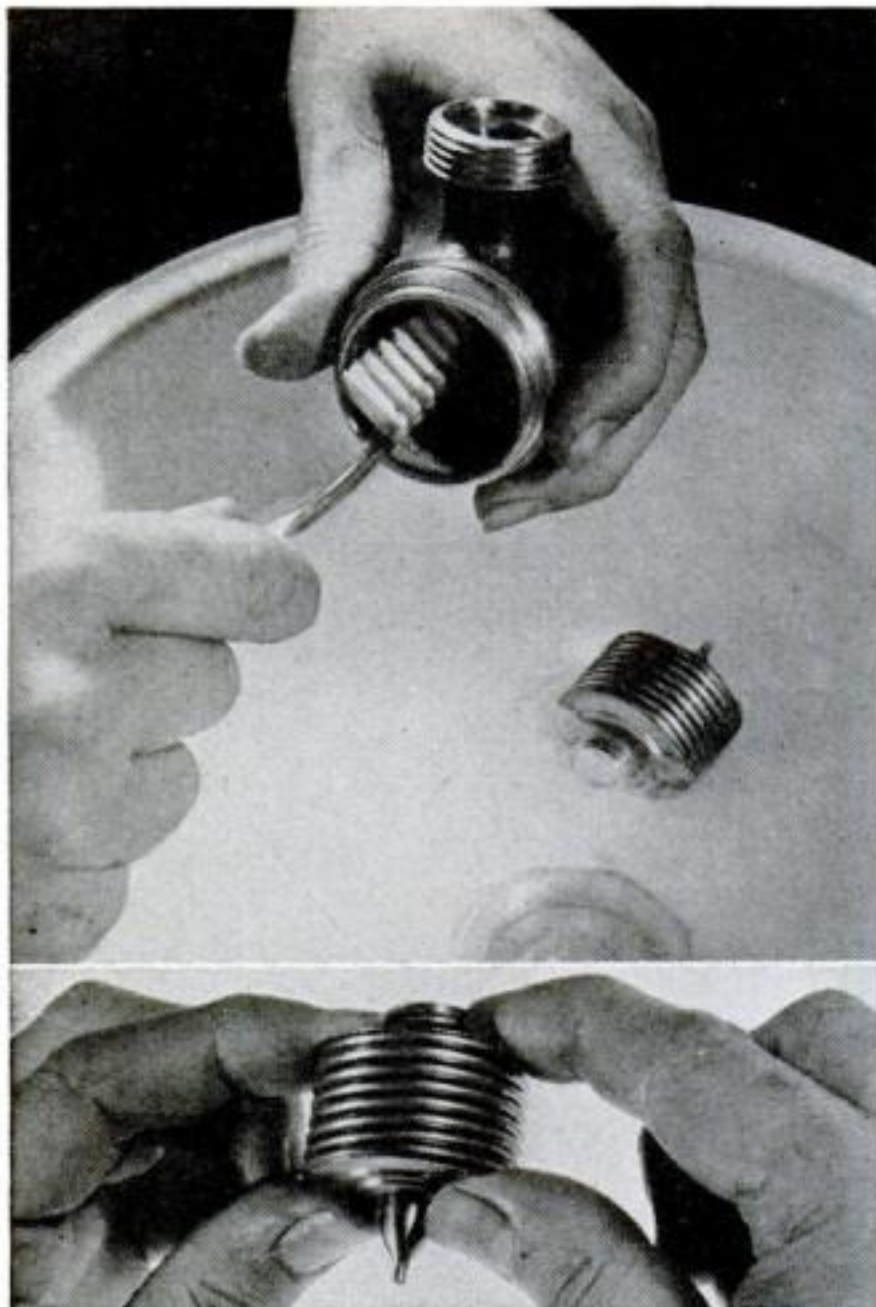
Air vent valves in most cases are sealed at the factory and can't be taken apart. However, they can be cleaned with strong soap and warm water, or with one of the commercial valve compounds.

diator. In this case, the water passes into the return line. But like the vent, it too closes when steam reaches the thermostatic element. If a trap does not operate properly, steam is wasted, passing through the radiator and into the return line.

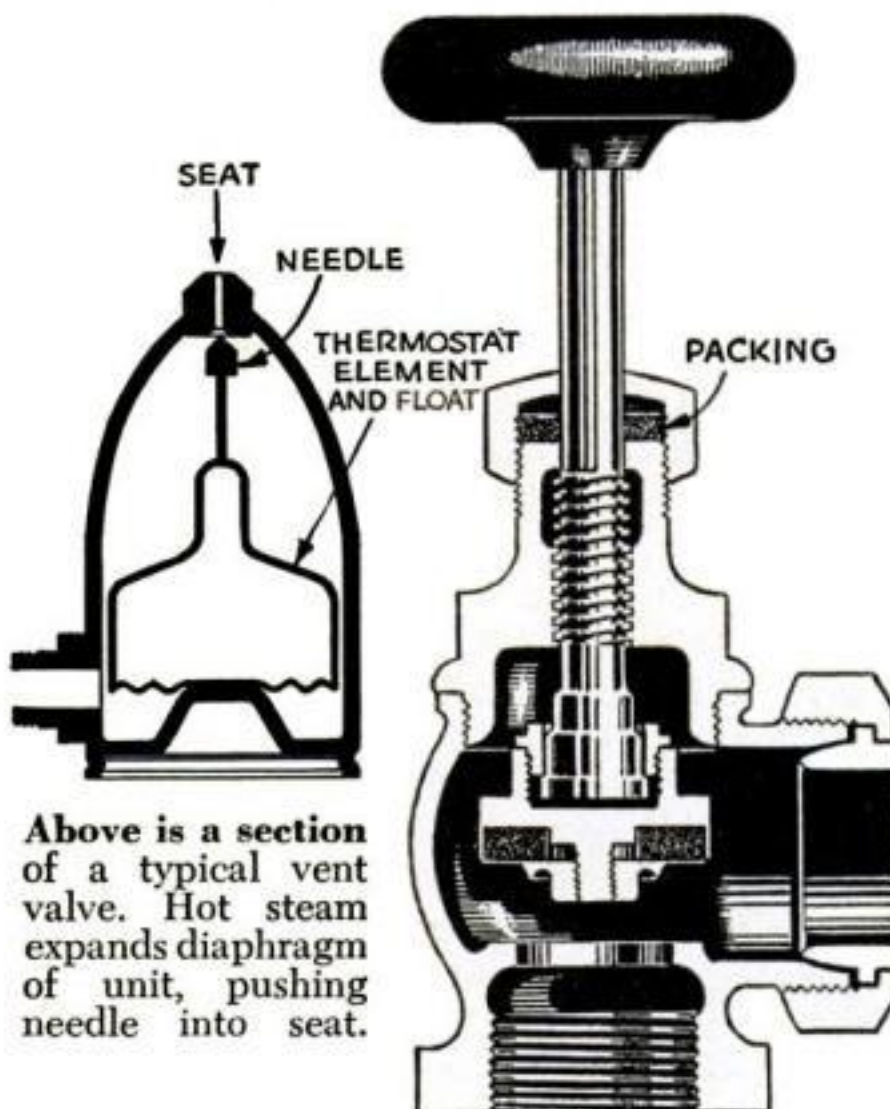
Some supply valves are packless, using a bellows-like thermostatic element to make a tight seal. Some traps also use this same element. One method of testing these is to squeeze them between thumbs and forefingers as shown in one photo on this page. If you can compress it, the element may be faulty. Test by this method only when the element is cold.

Thermostatic elements are replaceable, as are the seats of some valves. If the valves of the heating system in your home do not have renewable seats, you can ream out the old seat to make a steam-tight fit, or use a tap to thread the body for a renewable seat. Most manufacturers of valves supply such tools and parts.

Single-pipe systems should be fitted with main vents, although some are not. This is a valve near the end of the supply line, usually in the basement. Its function is to quickly vent the air from the line as steam rises, relieving the radiator vent valves of much of this work. If your system has a main vent, don't overlook cleaning it as you do the other valves. **END**

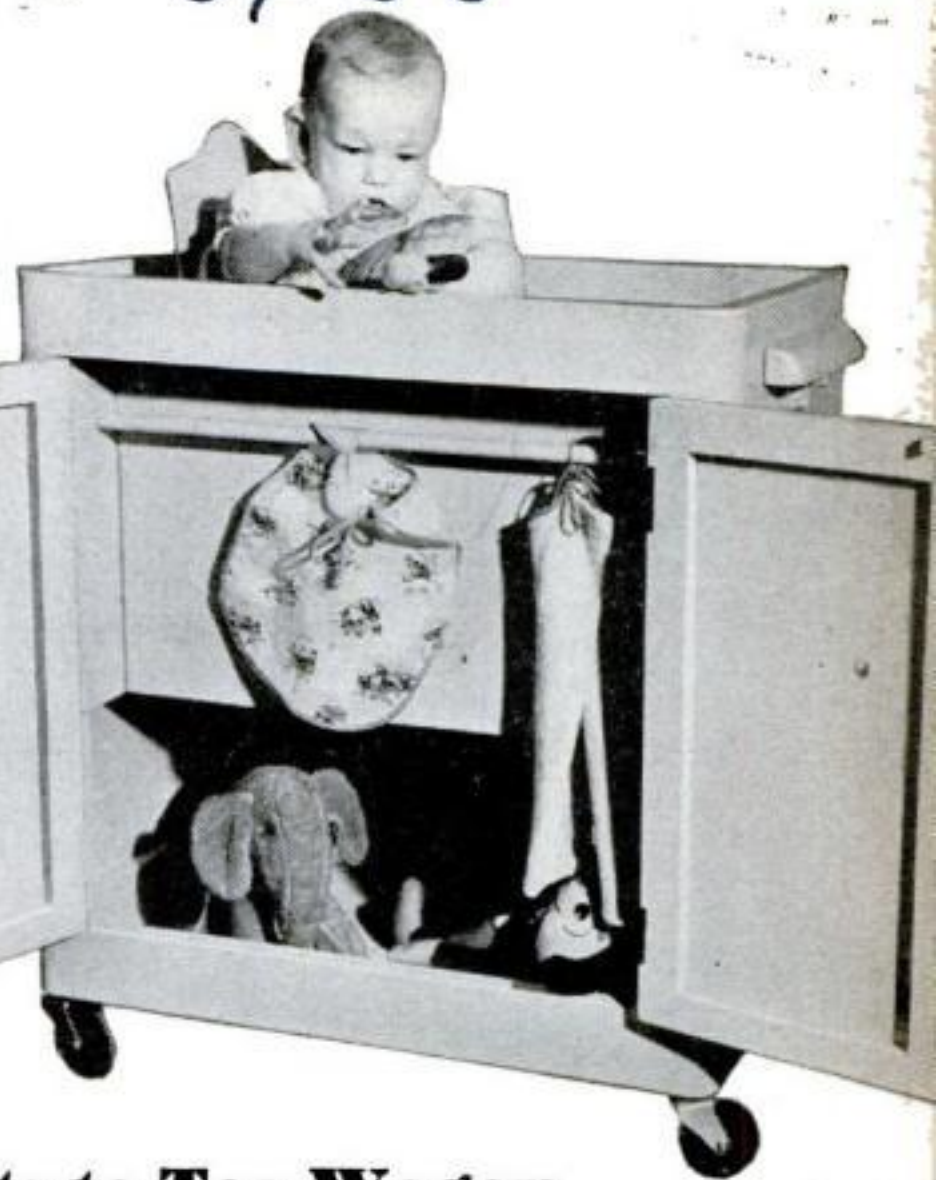
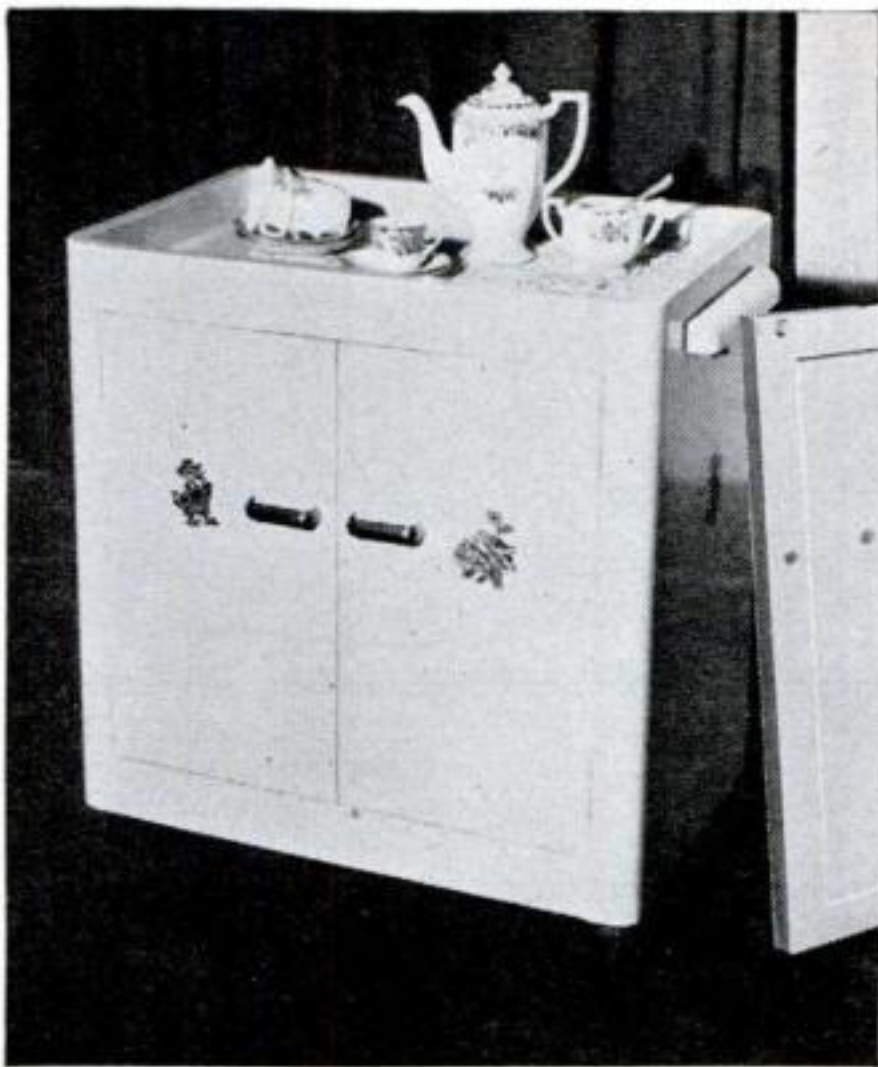


Traps pick up dirt and slime that may interfere with their operation. Clean them with soap and water, or with kerosene. Small photo shows a method of testing thermostatic elements.



Above is a section of a typical vent valve. Hot steam expands diaphragm of unit, pushing needle into seat.

When supply valves of this type leak steam and water around the stem, the packing needs replacing. Unscrew the packing nut at the stem, pull out old packing, and replace it with new.



Baby's Play Wagon Converts to Tea Wagon

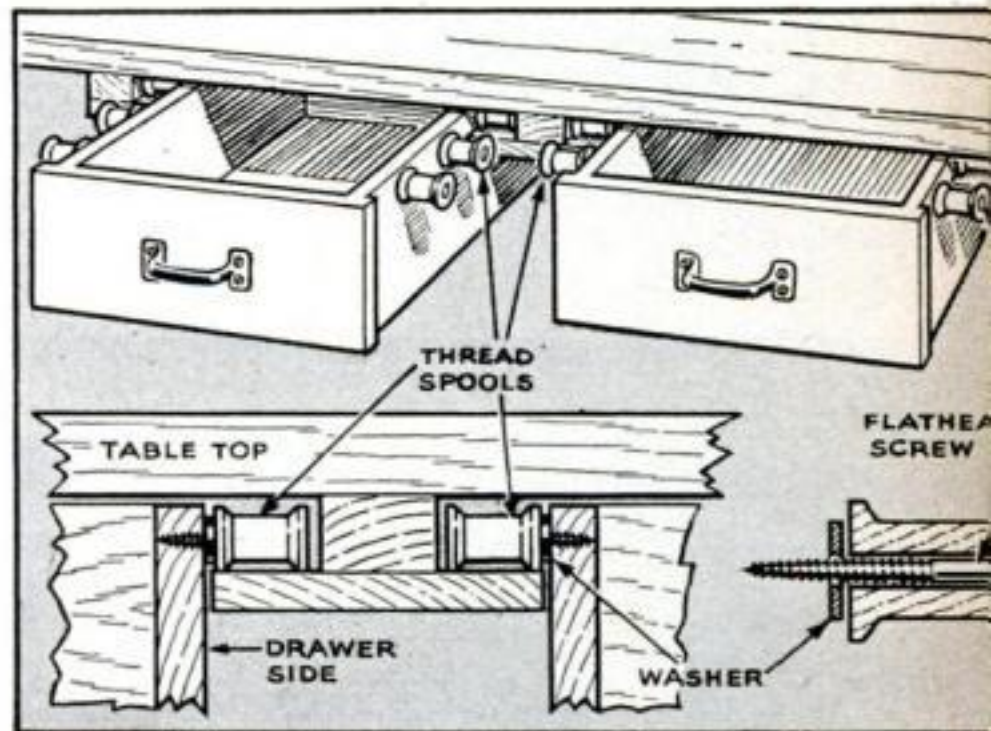
LATEST piece of nursery furniture in Australian homes is this mobile unit that serves as a high chair, play wagon, or tea wagon. At left, with the back rest lowered to complete the table top, it is a server. At right,

it is a high chair with a cupboard for toys and a rail for clothing. The sliding top locks with a safety catch to keep a baby securely in the chair. It was designed by Sidney Gumbrell, of Melbourne. •



Ash Tray Cut from Tobacco Can

Two rectangles cut out of the side of a tobacco tin make it a practical ash tray for shop, den, or hunting camp. Even in a breezy spot, ashes generally stay put because of its shape. However, it is easy to empty the tray by just opening the lid of the can. Cut away the tin with a knife or chisel and bend dents with pliers to keep cigarettes from rolling off the tray.—W. S. Gnann, Atlanta, Ga.



Drawers Roll Easily on Spools

DEEP, heavily loaded shop drawers slide smoothly on rollers made from spools. Use the same size spools on each one, screwing them to the side of the drawer. If you don't have that many spools, cut up a length of hardwood dowel and drill for screws. Rollers spaced 3" apart are about right for the average drawer. Washers fitted as shown in the drawing make for smoother action.—Victor H. Lamoy, Upper Jay, N. Y.

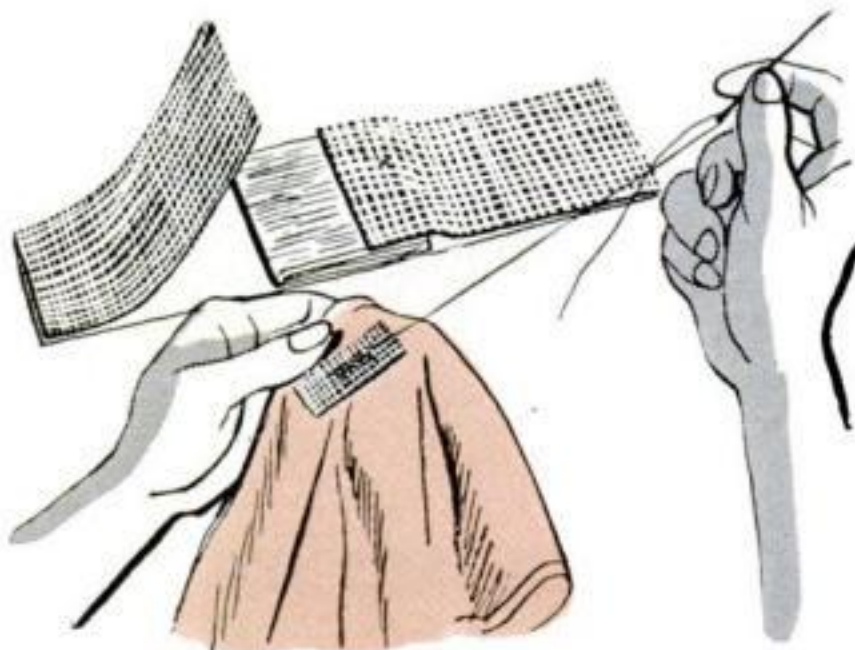
Keeping the Home Shipshape



If party guests have to leave their wraps on the bed, cover the spread with a transparent tablecloth. Coats will not soil the spread nor will they pick up any lint from it.



Drawer liners can be made in a fraction of the usual time if the inverted drawer is used as a guide. There are no sides to interfere with folding or cutting the lining paper.



Protective gauze strips from adhesive bandages make fine darning and mending aids. The starched strips give body during darning, and then the starch launders out.

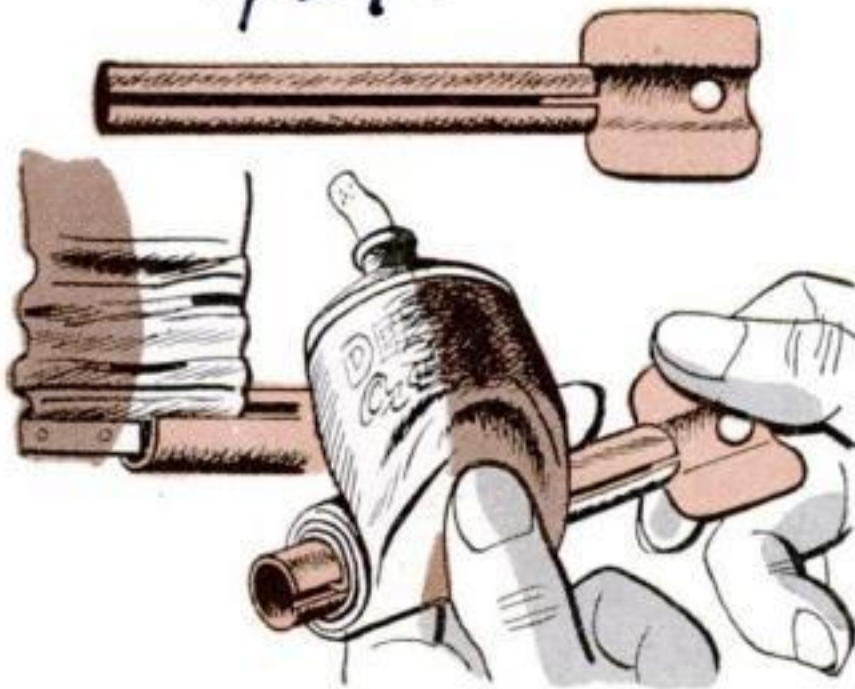


Dye will greatly improve the appearance of the worn parts of a rug. Applied with a window spray, the color goes on evenly and makes the signs of wear practically invisible.



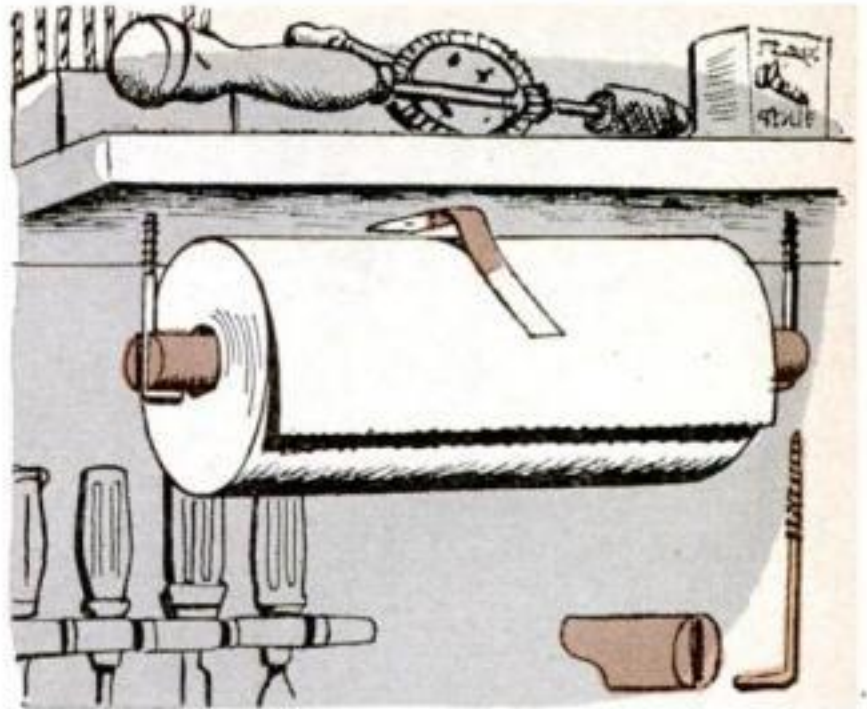
Wallpaper panels are of uniform width—18" is common—and so can be used for approximate measurements. Check the width once and you always have a "half yardstick" handy.

4272



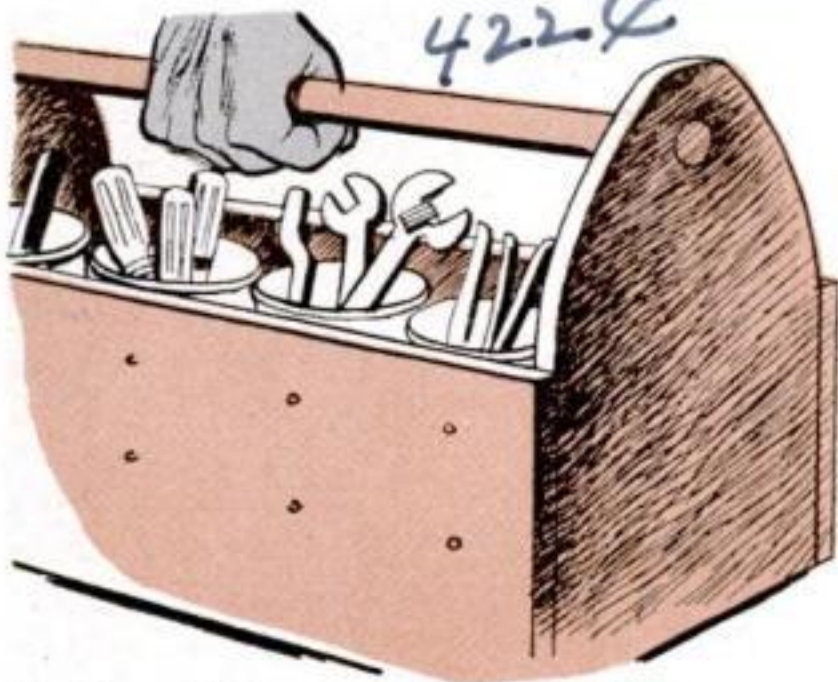
A **tube key** will help you squeeze out the last bit of tooth paste. Slot a 4" length of $\frac{3}{8}$ " aluminum tube, cut and bend a handle as shown. Slip it off before the tube is discarded.

6038



A **paper-towel dispenser** for the workshop is easily made from two long L screws and a $\frac{3}{4}$ " dowel with shallow end slots. A spring keeps the paper from unrolling too fast.

4224



Small tool bins are a helpful addition to any tool box. They can be made from ordinary tin cans whose tops have been cleanly sheared off. Attach the cans to the box with small screws.



Scratches on an unbreakable plastic watch crystal can be polished off with nail-polish remover or acetone. Use the liquid sparingly, applying it with a small wad of soft cloth.



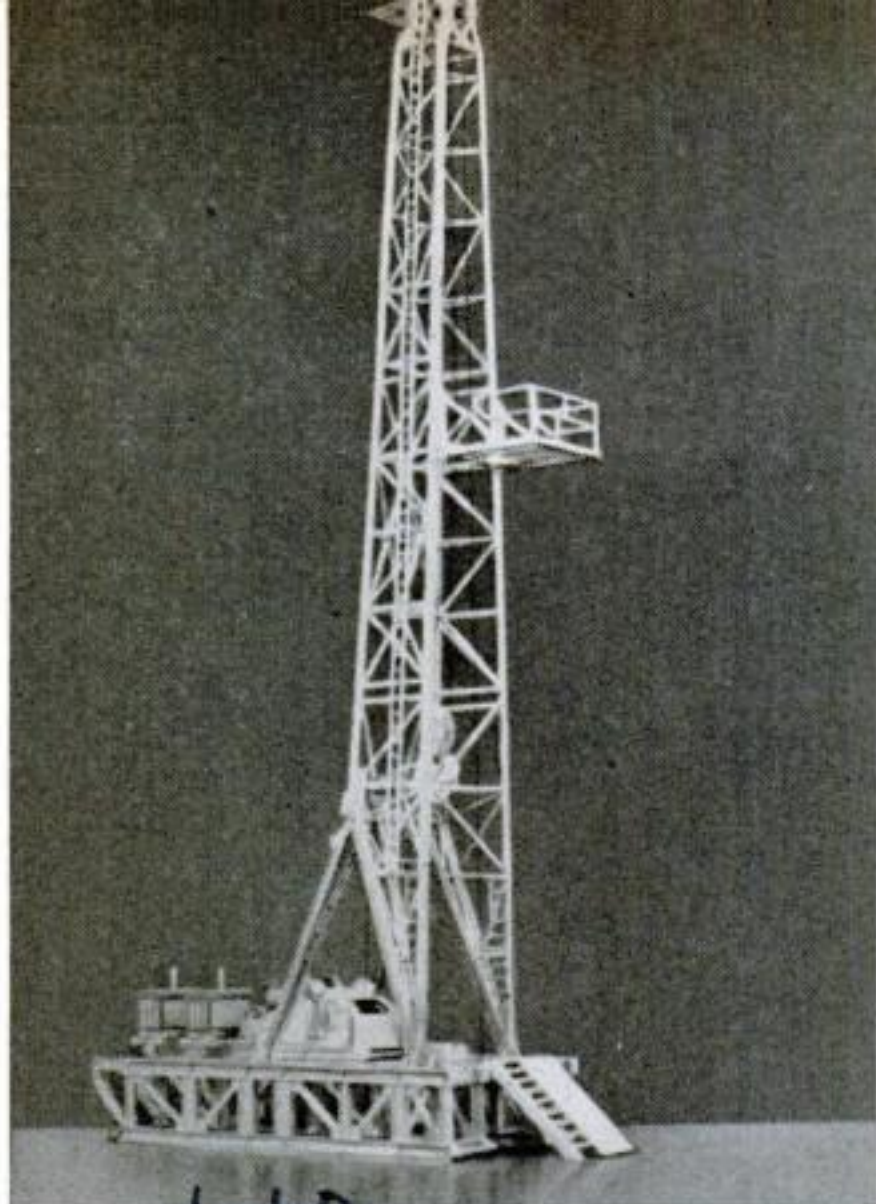
5243

Garden shoes and rubbers can be stored conveniently in a corner of the garage as shown. Hung on large nails or pegs, they dry out, keep their shape, and do not gather dust.

Craftsmen at Work



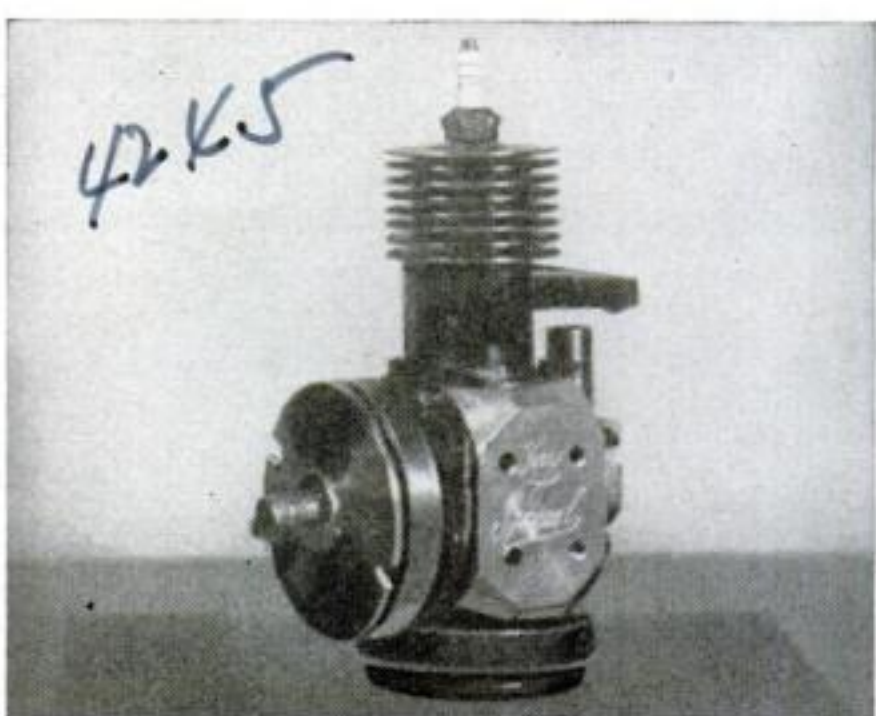
Battery Powers Tiny Car. An auto battery and starter motor are all the engine this miniature car needs. It was built by Vernon Garrison, a painter employed by Northrop Aircraft, Hawthorne, Calif., to suit his four-year-old daughter Barbara Jean. He whittled controls down to her size too, by using a single pedal that is an accelerator when pressed down and a brake when released.



Miniature Drilling Rig. Eighty-five pieces of wood went into the ladder alone on this model drilling rig built by J. S. Ackley, of Manhattan, N. Y. The derrick is 39" tall and the derrick floor 3" high. Construction is of balsa with the exception of pieces of screen used as floors for the two platforms on the derrick. Look closely and you'll see two engines at the left, the draw works, and the rotary table.

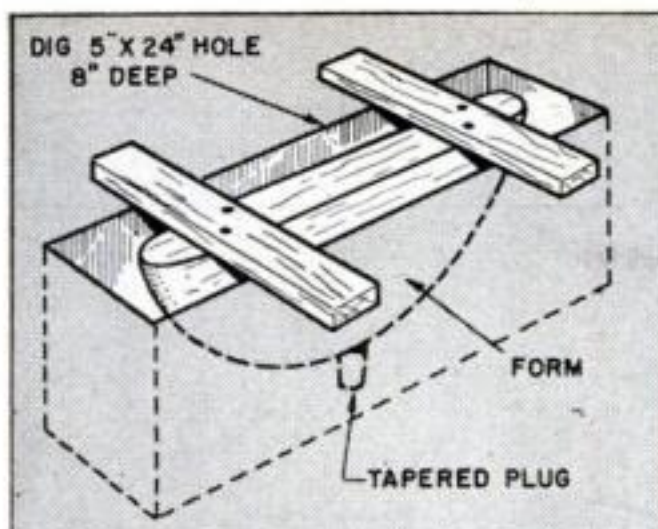


Runabout Made from PS Plans. Lawrence T. Dhu, of Derby Line, Vt., is pictured in the speedy outboard runabout he built from plans published in the July, 1938, issue of POPULAR SCIENCE. The planking, deck, and transom brace are $\frac{1}{4}$ " waterproof plywood with half-round molding on the chine.



Engine Drives Model 91 m.p.h. Plans for this midget gas engine were published in the June, July, and August, 1946, issues of POPULAR SCIENCE. Arthur P. Klucznik, of East Detroit, Mich., installed his version of the little power plant in a model racer. He says he's clocked the car at 91 m.p.h.

6033

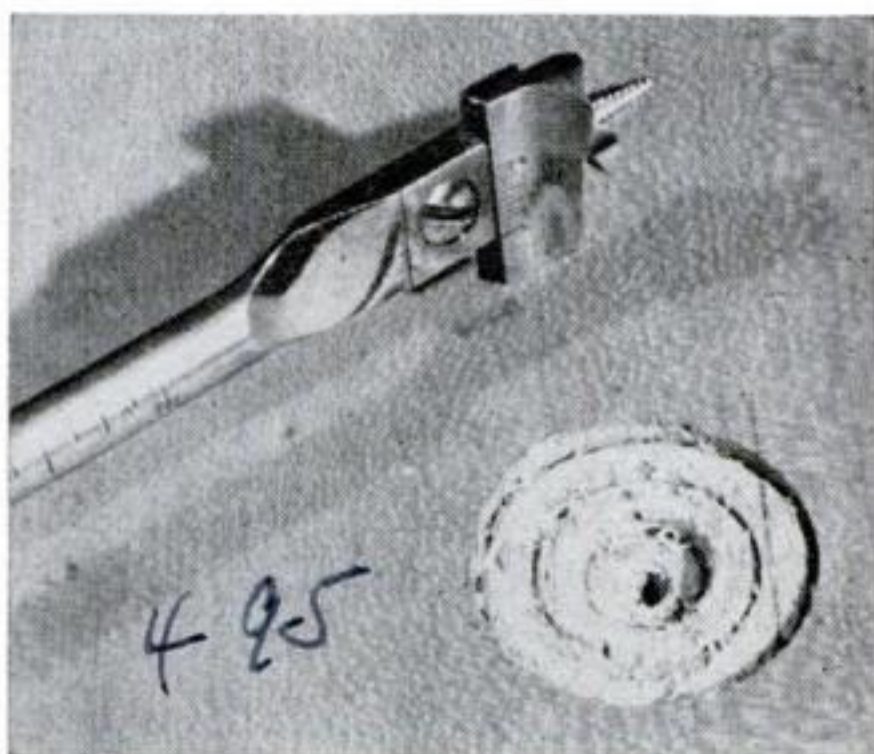


Bicycle Stand Is Modeled on European Pattern

LONG used in Europe (the photo above shows a main street in Zurich, Switzerland), this simple bicycle stand may be just what you have needed to keep your kids' bikes from being draped over the back-porch railing. It's simple to construct and the dimensions can be varied to accommodate anything from junior two-wheelers to motorcycles.

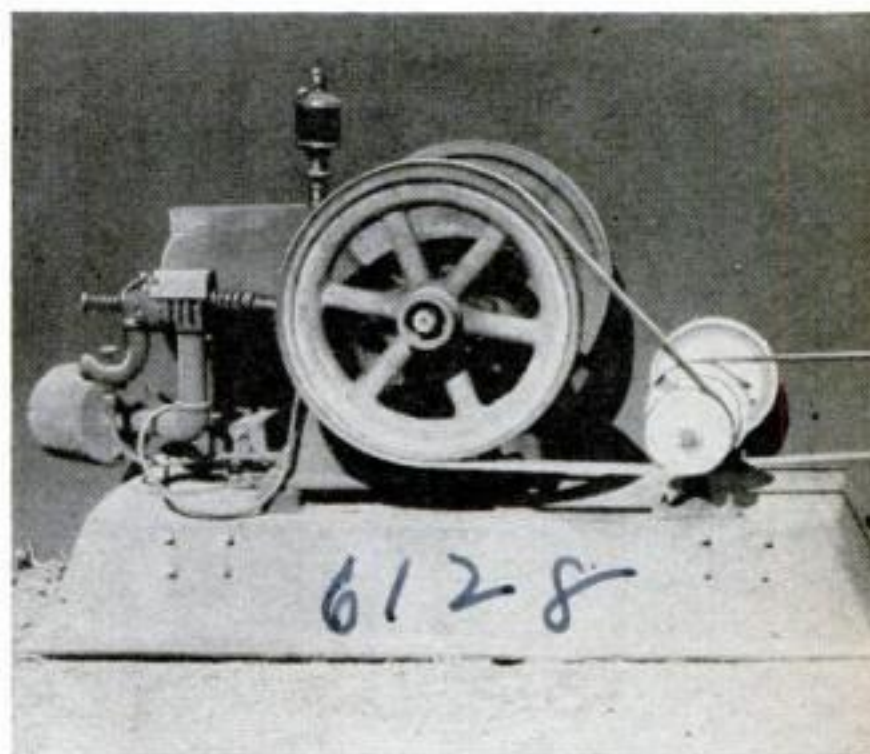
On a board slightly thicker than the bicycle wheel, scribe an arc corresponding to part of the wheel's circumference. Saw the

board to the line and attach a tapered plug to the lowest part of the arc. Dig a hole in the ground approximately 5" by 8" by 24", and suspend the wooden mold in the center of it. Square the top edges of the pit, using boards, if necessary, to make sure that the surface of the stand will appear as a neat rectangle. Pour concrete around the mold. See that the plug for the drain is driven firmly into the ground so that no concrete can flow under it. The hole it forms will act as a drain.—W. Van Zandt.



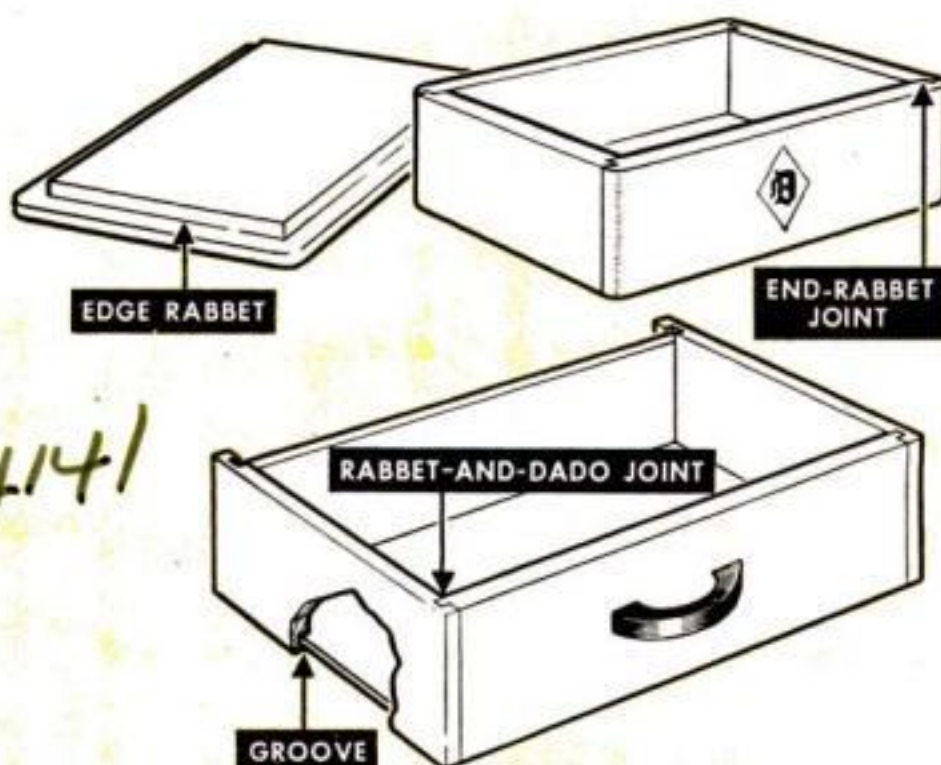
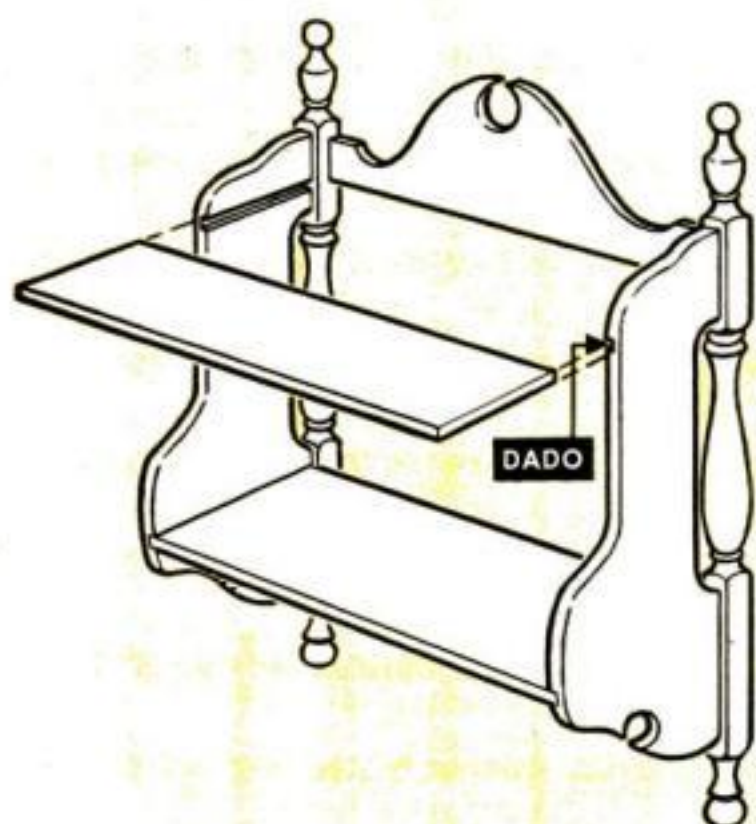
Extra Cut Reduces Chipping

EXPANSIVE bits often mar surfaces by lifting chips beyond the finished diameter. There will be less likelihood of damage if you first cut to the depth of the spur at a smaller diameter. Then reset and cut to final size.—Will Thomas, Kenmore, N. Y.



Sink Damps Engine Vibration

A FLAT cast-iron sink, set bottom up, makes a sturdy foundation for a small stationary gas engine. Bolt the engine to the sink with wooden blocks between. The sink absorbs enough vibration to prevent troublesome "creeping."—W. Anderson, Salem, Mass.



Rabbeting and Grooving by Hand

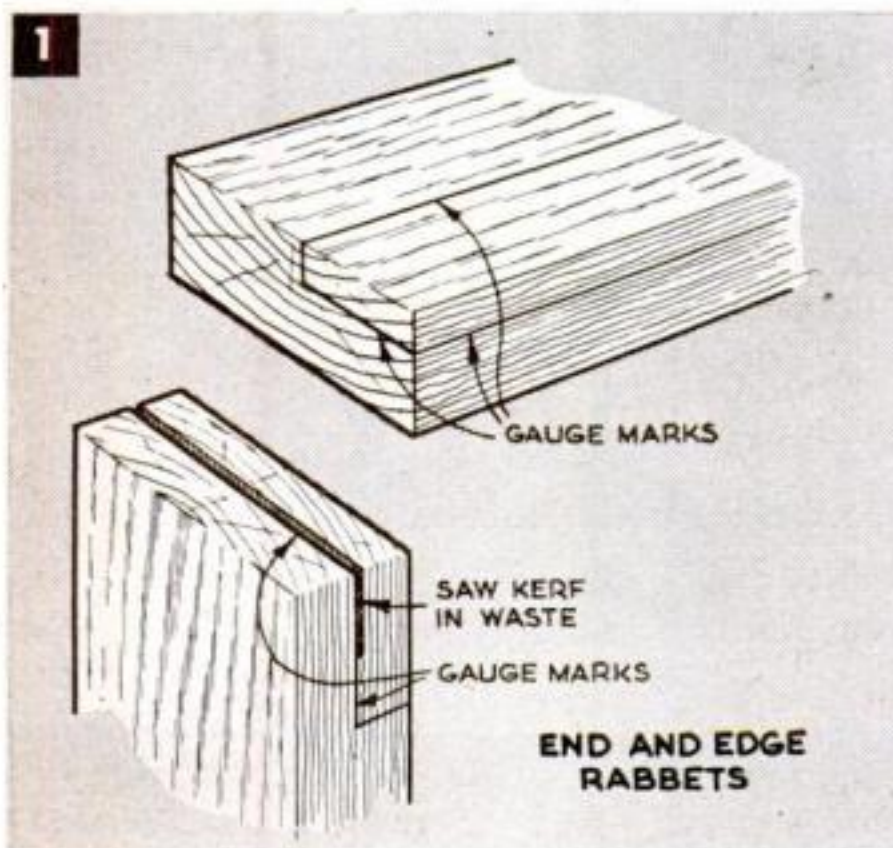
These two basic operations underlie the making of sound joints in wood.

By Edwin M. Love

LIKE the first pair of long pants, the first rabbet or dado joint is a real milestone in a novice craftsman's experience. Making butted or cleated joints is something that the

noncarpenter does almost instinctively. But to make a well-executed rabbet joint is to take an unmistakable first step down the road toward woodworking craftsmanship.

Not that there's anything wrong with butting or cleating two pieces of wood together. In plenty of applications—the shelves in a kitchen closet, for example—cleated construction is simple, quick, and amply strong for the purpose. But in the case of a nicely fin-



ished piece of living-room furniture, say, a maple bookcase, nailing the shelves in from the sides is practically a workshop scandal, and cleats aren't much better. For looks, strength (especially against "cornering" stresses), and plain woodworking craftsmanship, a dado joint is in order here.

Rabbets, grooves, and dados are a way of creating two or more meeting surfaces where only one would exist without them. A rabbet is a recess in the end or edge of a piece of stock; a groove is a channel that runs along the grain of the board. Cross-grained or edge-to-edge channels are called dados. Grooved joints may employ any of these cuts in a variety of combinations. Some examples are shown on the facing page.

Cutting End Rabbets

Any shop, so long as it has saws and chisels, is equipped for rabbeting and grooving. To establish the dimensions of a rabbet, gauge lines along the face, end, and edge as illustrated in Fig. 1.

End rabbets are usually sawed. While a backsaw (Fig. 2) is most convenient, a rip saw is also satisfactory and is generally the choice of carpenters. Nudge the saw to the line with the extended thumb of the left hand. Start cutting at the near corner but level off when the kerf has been cut to the shoulder.

The standard method of cutting the shoulder is shown in Fig. 3. Square the line with the point of a knife, lay the work on a pair of bench hooks, and start sawing at the far end. Steady the saw with the thumb or forefinger and level out as the work progresses. If the cut is level the waste block will fall away as

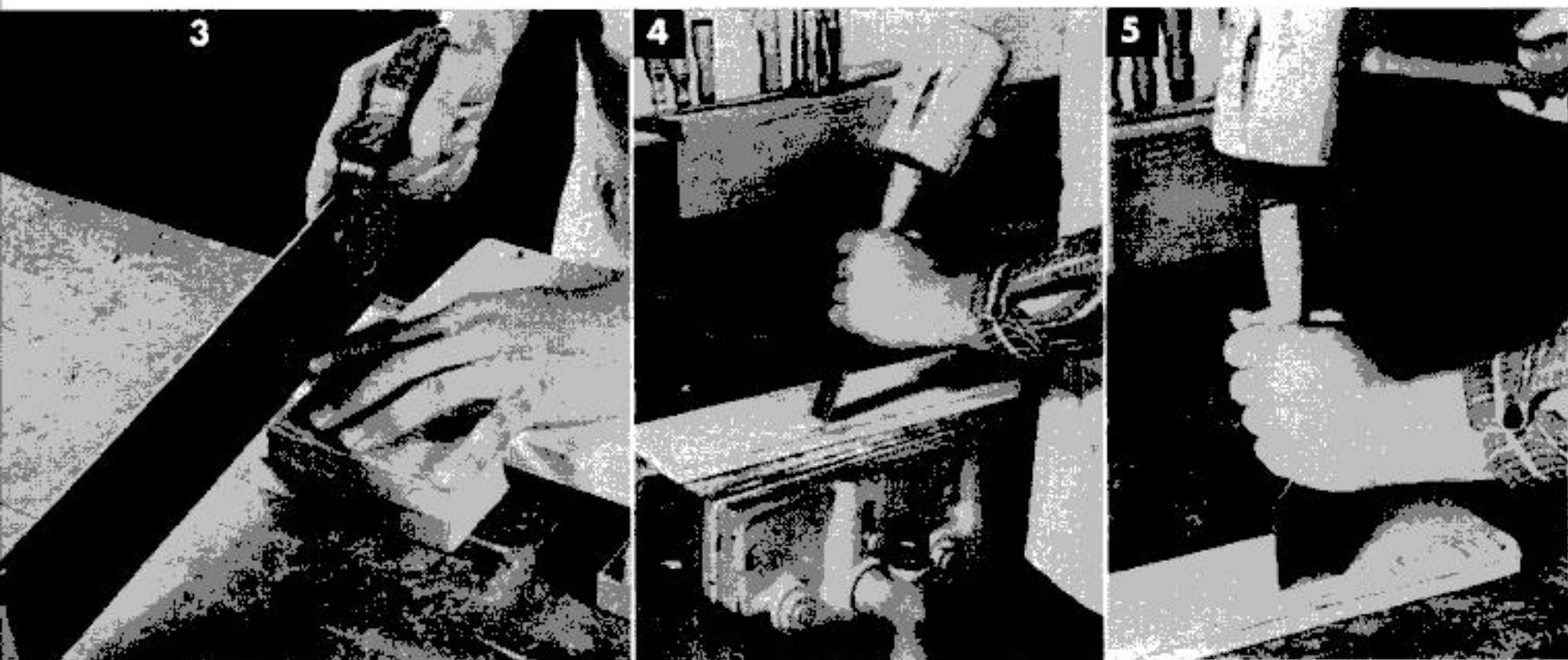
soon as it is severed, thus insuring against cutting into the bottom of the rabbet and spoiling the job.

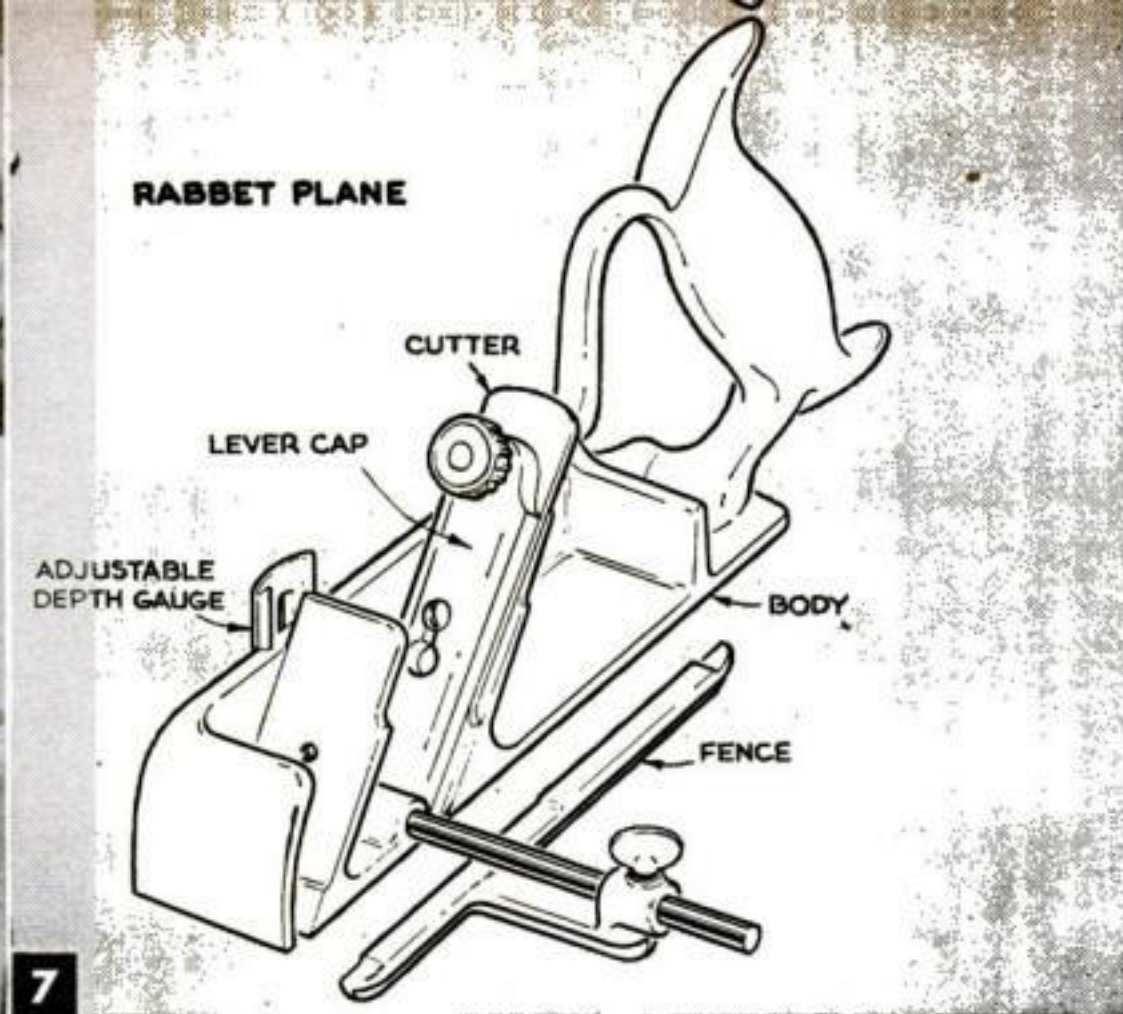
Edge rabbets are more commonly chiseled, although shorter and deeper ones can be sawed as described for end cuts. With the lines gauged, lay the piece on the bench, face up, and cross-score nearly to depth as shown in Fig. 4. Follow this by roughing the shoulder with a wide chisel as in Fig. 5. Rough out the waste with the chisel held horizontally, bevel up (the technique, in a different application, is pictured in Fig. 10). Trim the shoulder and the bottom of the rabbet to the line.

A well-chiseled rabbet is ready for assembling, but sanding is needed if it is to serve as a molding. Fold a piece of coarse paper around a square-edged block for the first sanding, and follow with finer grits. A scraper is also useful for leveling off the high spots.

Rabbet Planes

The saw-and-chisel combination is perfectly adequate for the occasional rabbeting or grooving job, but for a lot of this work it pays to have one of several special planes. Two different types of rabbet plane are shown in Figs. 6 and 7. The cutter is a single plane iron held in place by a lever cap. It is important that the cutter edge be sharp, straight, and square, and it must also be locked exactly flush with the side of the plane working against the rabbet shoulder. Adjust the iron for depth of cut by sighting along the sole, as with a jack plane, or by testing the edge projection with the finger. A spur screwed to the side of the plane slits





the shoulder just ahead of the cutter. Depth of cut is regulated by a gauge on the spur side.

The simple rabbet plane (Fig. 6) has no fence; it is guided by a strip of wood nailed to the surface of the board. By tacking the fence strip obliquely it is possible to make the rabbet wider at one end than the other. The fence, of course, can be clamped on if you wish to avoid nail holes. Secure the work in a tail vise to keep it from sliding on the bench. In place of the vise, a strip clamped to the bench at the far edge of the board can be used to hold the work still.

A rabbet plane fitted with a fence is pictured in Fig. 7. The thumb of the left hand can be hooked behind the front of the plane to steady it. With this tool no fence strip is needed so long as the shoulder of the rabbet is to be parallel with the edge.

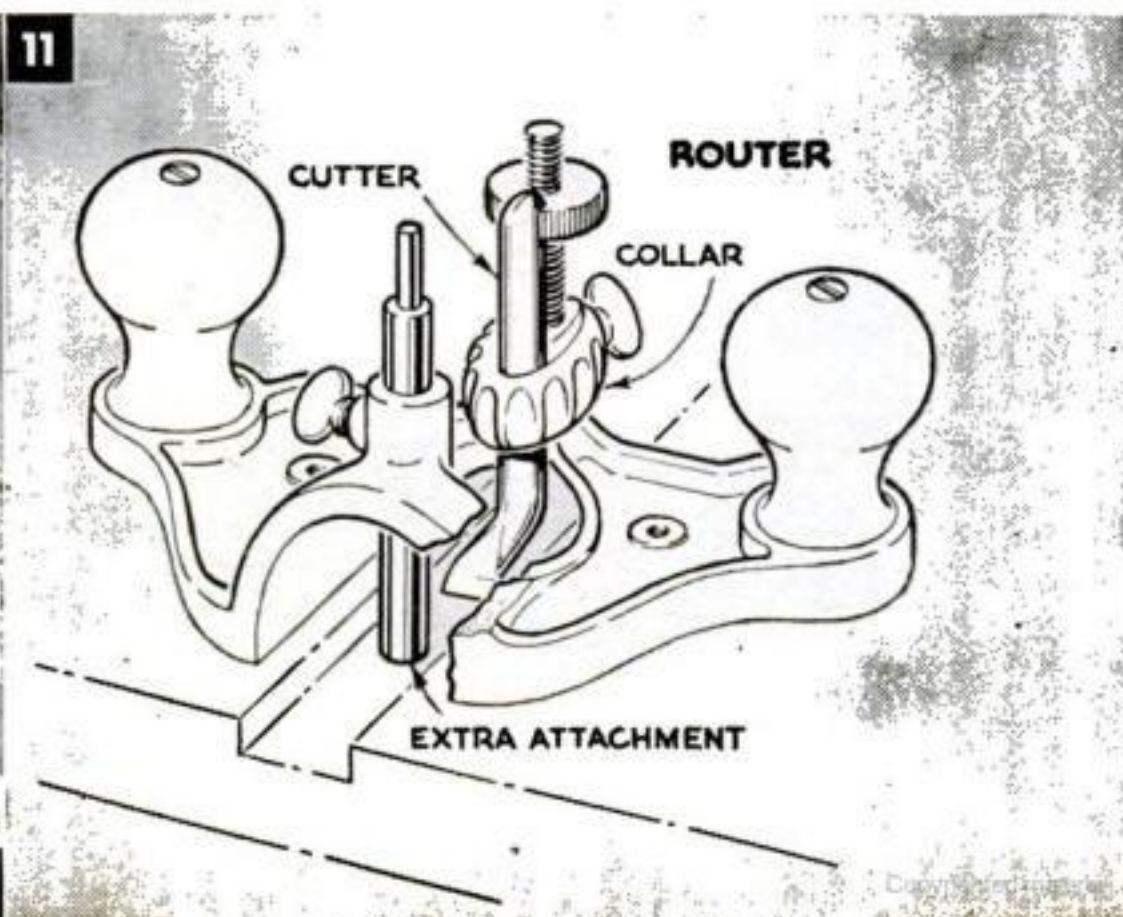
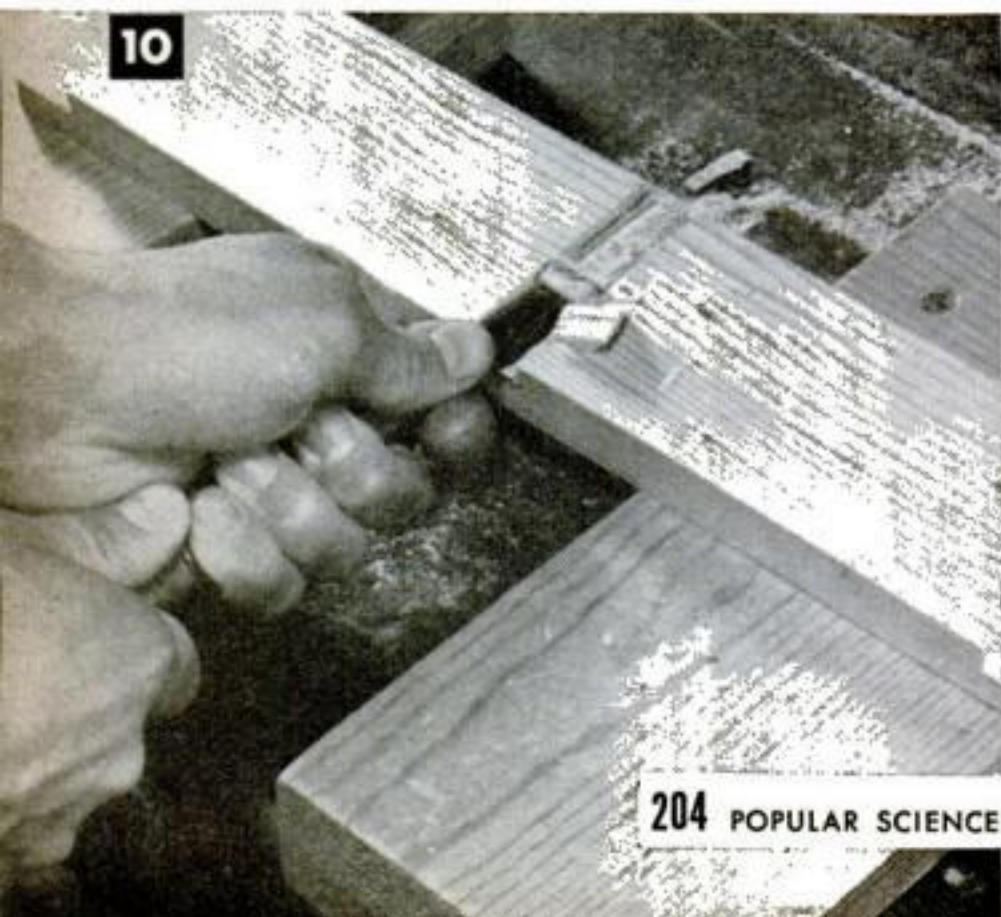
A sloping or ragged shoulder may result if the plane iron is dull, out of square, or not flush with the side. Sharpen or adjust the cutter; then correct the rabbet with a chisel

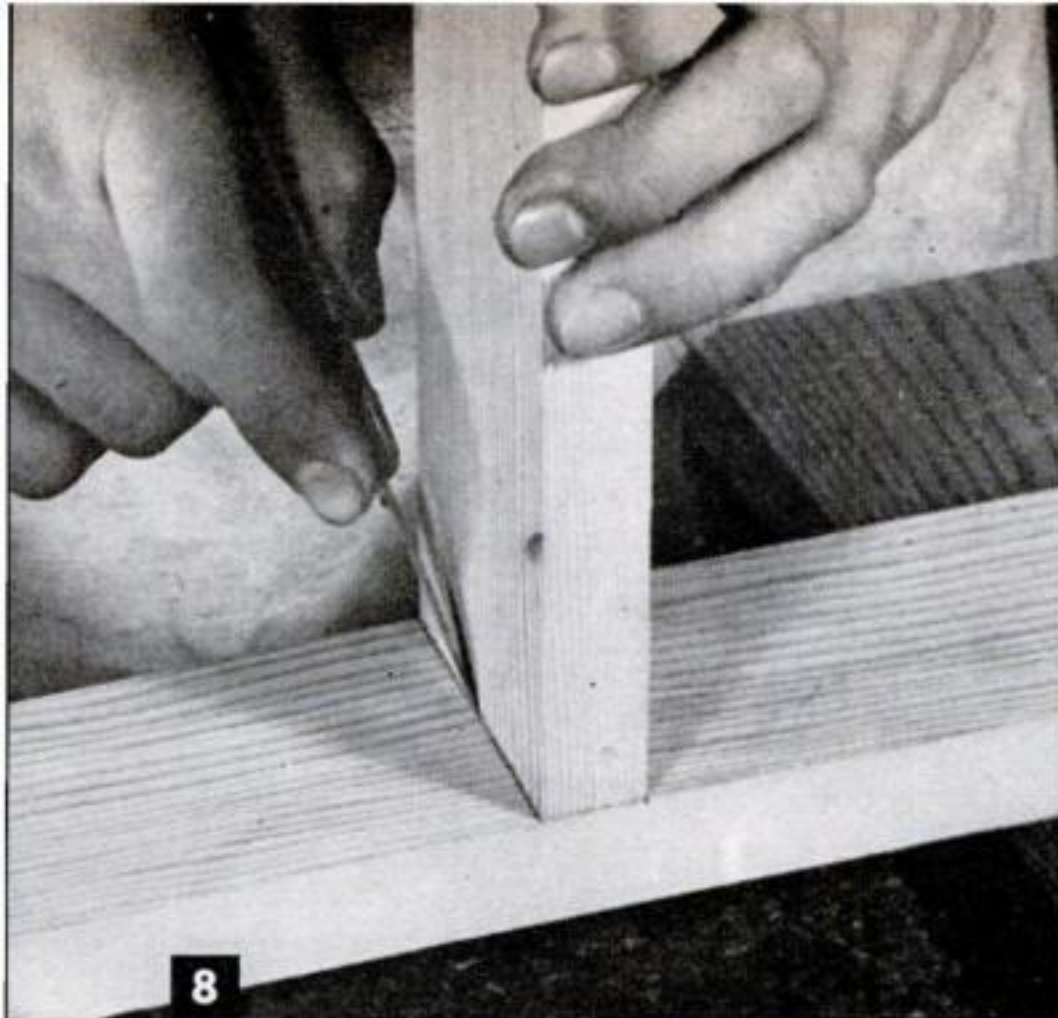
before continuing the work. While a rabbet plane can be used to cut across the grain, you will usually find it better and easier to saw to the shoulder, split out the waste with a chisel, and use the plane only for smoothing the bottom.

Grooves and Dadoes

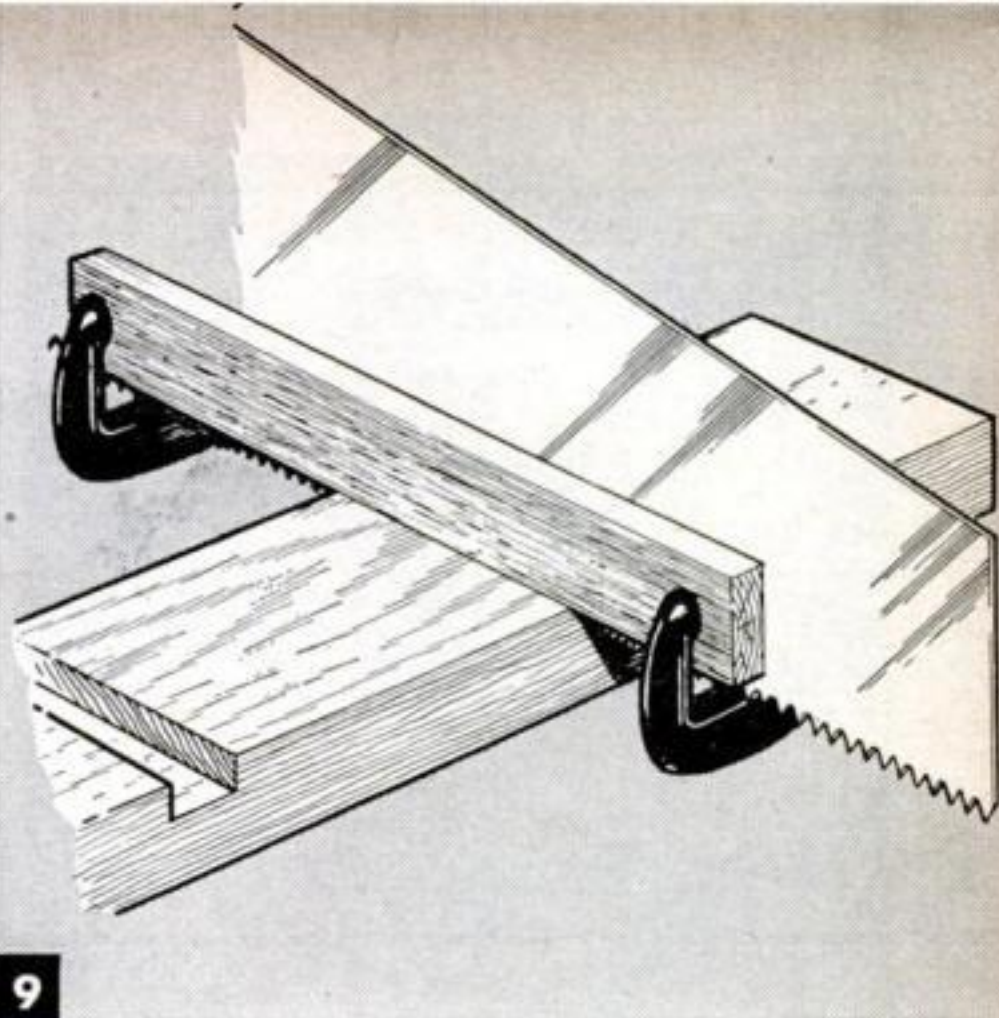
A groove can be chiseled in much the same manner as a rabbet. On short work the sides may be cut with a saw; since they must be perfectly straight and parallel, it is a good idea to clamp a strip of wood along the gauge mark to guide the saw.

Dadoes, which are grooves cut across the grain, are most often made to receive the ends of other members, as in joining a shelf to the side of a bookcase. The end to which a dado is joined may be plain or rabbeted as shown in the upper drawing at the beginning of this article. You can readily see the advantage of the rabbet and dado joint in this application: no ordinary pull on the





8



9

drawer front can separate the two members.

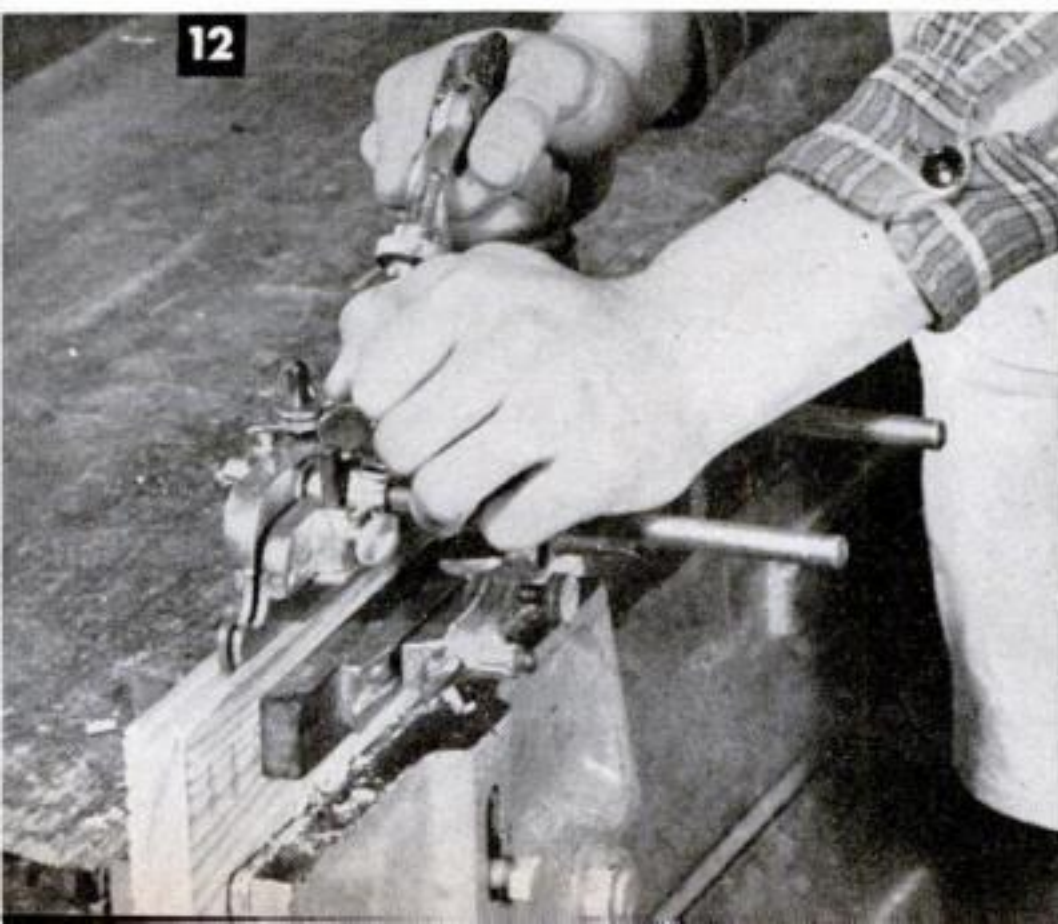
If a dado is too big, the joint will be both weak and unsightly. Accurate layout is therefore the first essential of a good dado. Square a line across the face of the piece and scribe a line for the other side at a distance equal to the thickness of the joining member. Many woodworkers like to use the joining piece itself as a pattern (Fig. 8) because it compensates for unequal thickness along its length. Gauge for depth and saw the sides accurately. A stop clamped to a saw blade as in Fig. 9 will guarantee the proper depth of cut. Bevel the edges of the waste toward the saw line and chisel out the bottom (Fig. 10). To prevent splintering of the edges, chisel half way across from one edge and finish from the other.

Router and Combination Plane

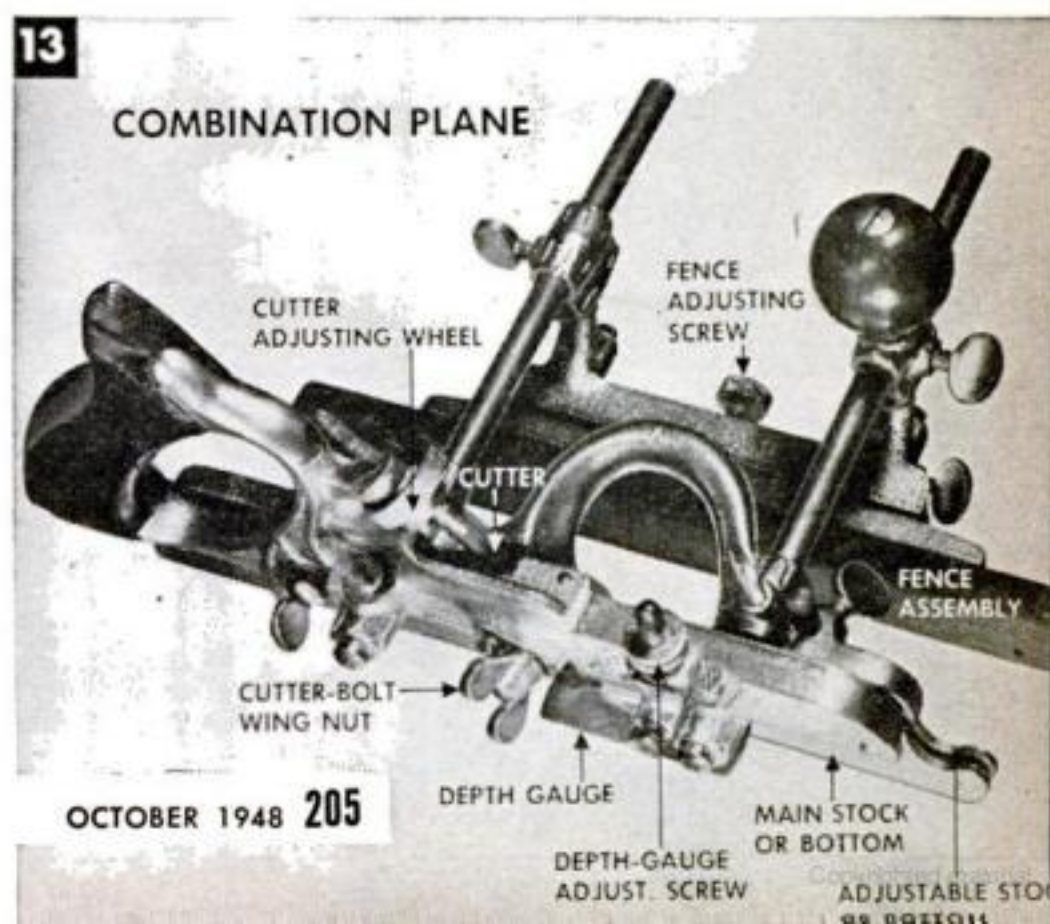
Dado planes are seldom seen except in production shops because each one will make a cut of only one width. More generally use-

ful is a router (Fig. 11) which planes the bottom of any groove after the sides are cut. One or two heavy cuts remove the waste, while smoothing results from another pass with a fine-shaving adjustment.

One of the best all-around tools—if somewhat on the expensive side for small shops—is a combination plane (Figs. 12 and 13). A variety of cutters is provided to enable it to rabbet, plow (groove), match (tongue-and-groove), bead, and so on. A method of plowing a groove in the edge of a board is pictured in Fig. 12. Note (in Fig. 13) that the body or stock is divided into parallel sections, both of which carry spurs. For plowing, slide the adjustable stock into alignment with the side of the cutter. A rabbet is made by clamping the cutter to the main stock, adjusting the depth of cut and the depth gauge, and setting the fence. The cutter used should be somewhat wider than the rabbet to be made so that it will project beyond the wood and leave a clean edge. END



12



13

COMBINATION PLANE

CUTTER
ADJUSTING WHEEL

FENCE
ADJUSTING
SCREW

CUTTER-BOLT
WING NUT

DEPTH GAUGE

MAIN STOCK
OR BOTTOM

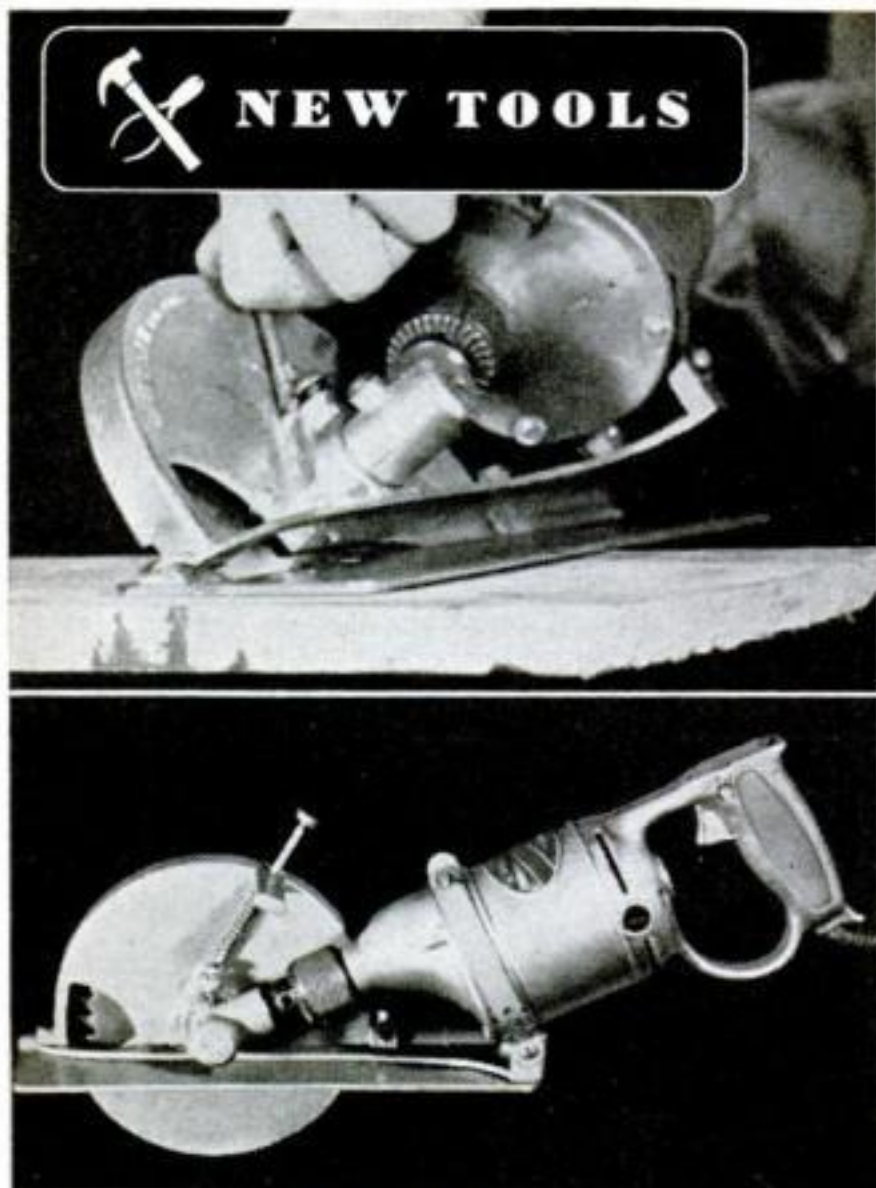
OCTOBER 1948 205

DEPTH-GAUGE
ADJUST. SCREW

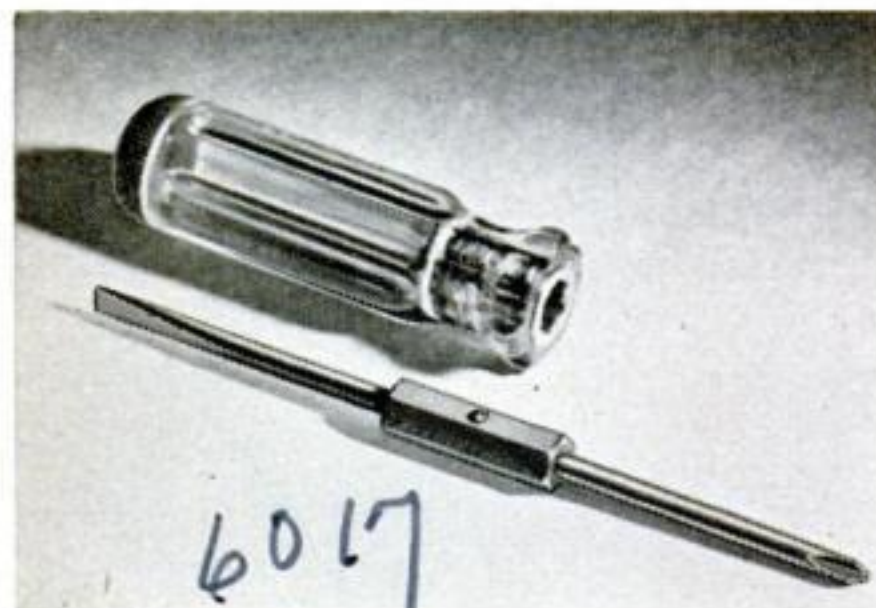
ADJUSTABLE STOCK
OR BOTTOM



NEW TOOLS

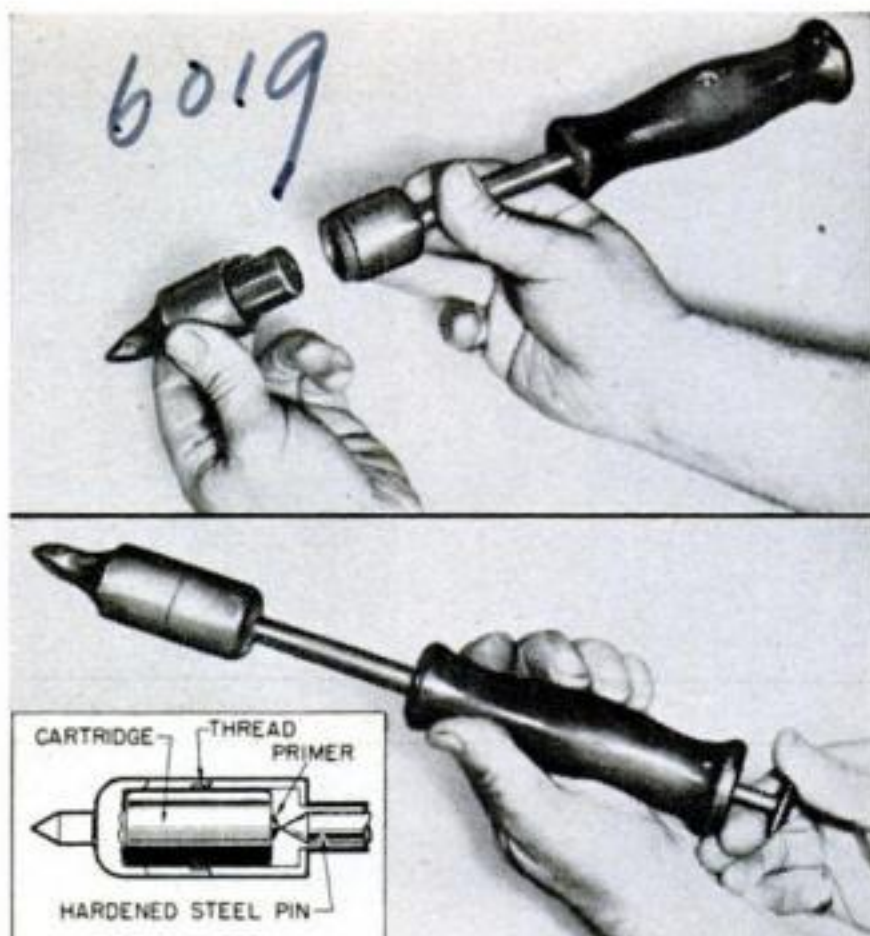


Saw Attaches to Drill. A 6" circular saw made by Future Products Company, of Portland, Ore., can be used with most electric drills. It rips or cuts material up to 2 1/8" thick and can be adjusted for beveling at any angle up to 45 deg. Binding straps secure the attachment to the drill. Not a production tool, the attachment is intended for handymen and occasional users. It's called a Lite-Saw ®.



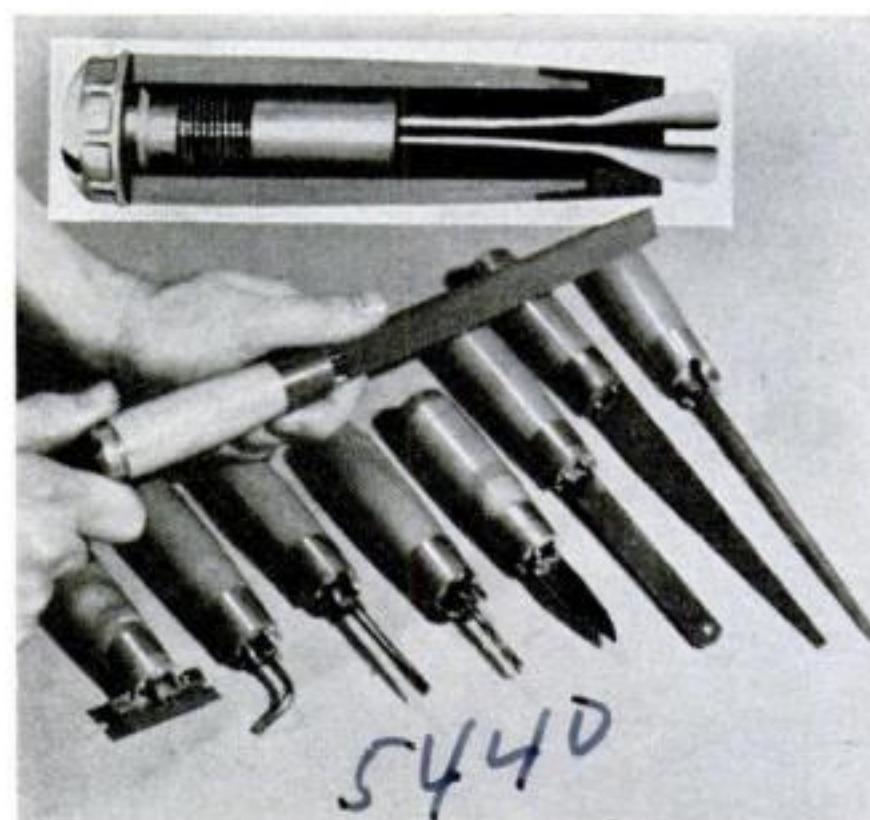
Screw-Driver Blade Reverses.

This is a screw driver with a double purpose. There's a regular bit on one end, a Phillips bit on the other. Spring action at the center of the blade keeps it secure without play, yet it's quickly turned end for end in the plastic handle. Vaco Products Co., Chicago, supplies it for about \$1.



Soldering Iron Has Own Heat.

The reaction of a metallic powder and oxidizing agent supplies heat for a soldering iron introduced by Kemode Mfg. Co., of New York. Sealed in a cartridge that's inserted in the iron, the powder and oxidizer react when a spring-tensioned plunger is withdrawn and allowed to strike a primer. One cartridge is good for 8 or 10 minutes of soldering. The iron sells for about \$5, the cartridges for about 12 cents each.



Handle Grips Any Tool.

Here's a tool handle with a chuck that gives a positive grip on a shank of any shape. A twist of the wrist shifts it from one tool to another in a matter of seconds. Some of its applications are pictured above. A product of the Speed Corp., of Portland, Ore., the handle sells for about 85 cents.

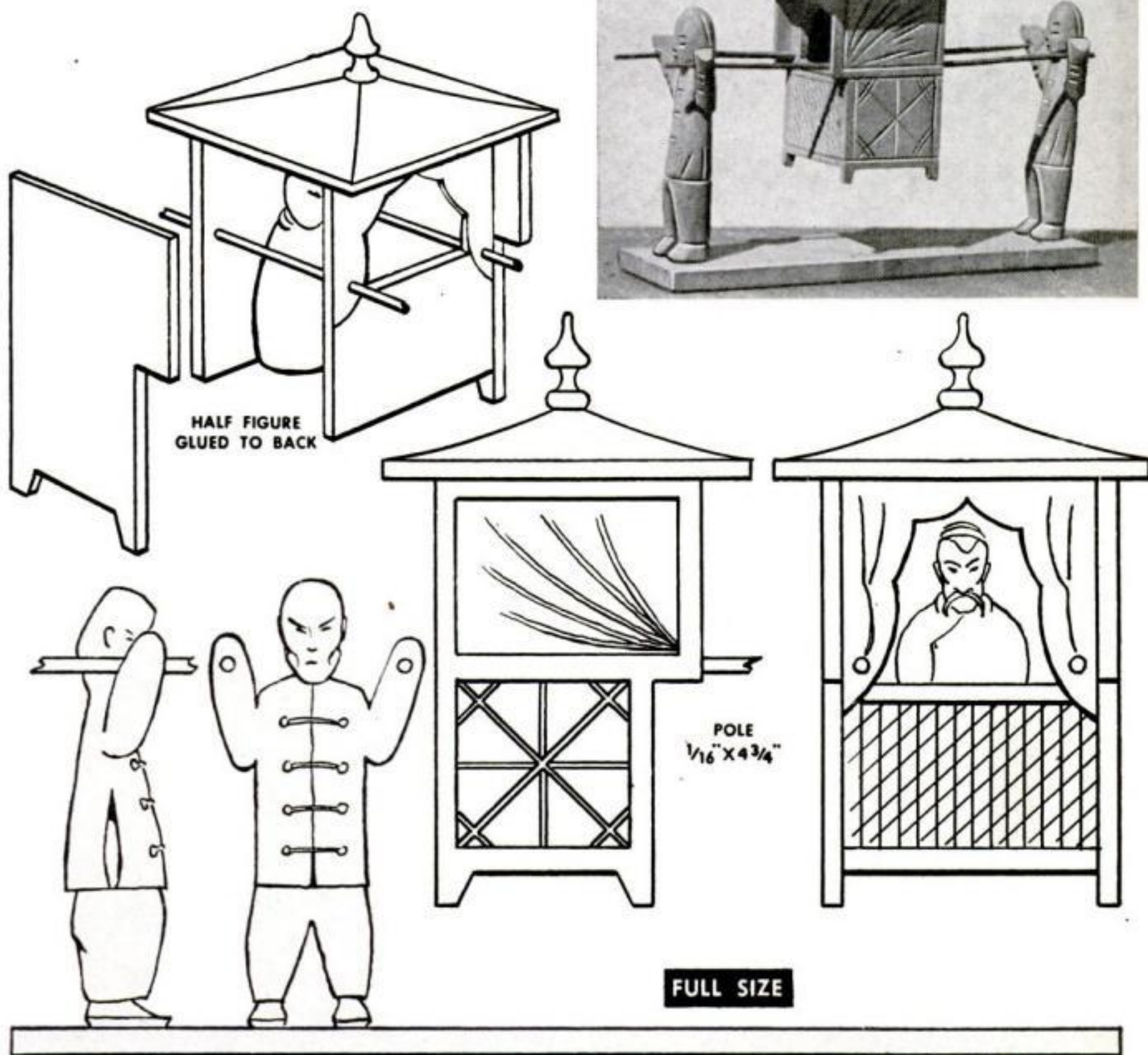
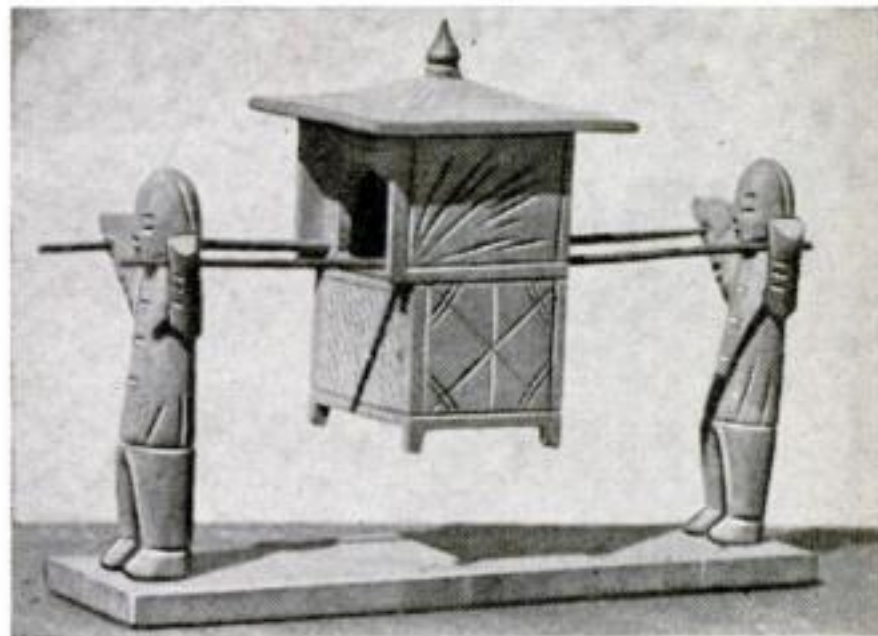
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Tiny Sedan Chair Carved from Pine

SHOWN in the photo is a little sedan chair believed to have been carved in China some 300 years ago. A copy is easy to make.

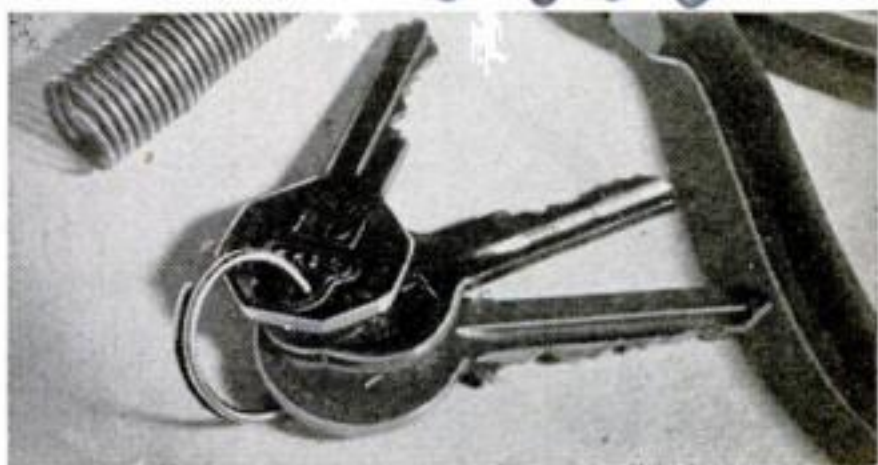
For the chair, use $\frac{1}{8}$ " white pine, thinner if you prefer. The drawing shows the flat parts full size. Complete the carving before assembling the parts with glue. Eyebrows are painted on the coolies and eyes indi-

cated by a dot. The mandarin inside need have only the head and shoulders carved since that's all you can see. The carrying poles are bamboo splints. Leave the wood unfinished.—Hi Sibley, Nuevo, Calif.



Key Rings Cut from Spring

IF THERE'S an old expansion spring about $\frac{3}{4}$ " in diameter lying around your workshop, you can quickly make all the key rings that you'll ever need. Simply cut off about one and a half turns for each ring and file the cut ends smooth. If the spring is too hard to cut with pliers, nick it with a small triangular file.—Will Thomas, Kenmore, N. Y.



Giving Steel a

How some chemical compounds make case-hardening steel a cinch in your own home workshop.

By Walter E. Burton

HARDENING the surface of iron or steel is one of the most ancient crafts in the mechanic's kit. Smiths of bygone centuries knew some ways of producing sword-resistant armor. Similar, though improved, techniques are used today to harden gears, machine parts, tools, and countless other things that must be hard and resistant on the outside but can't afford to be brittle on the inside.

That the art of case hardening never gained much of a foothold in the small workshop is surely not due to its lack of value to the home craftsman. Rather you can ascribe it to the fact that until recently it has been an exacting and time-consuming operation.

It doesn't have to be that any longer. Today you can grind an ordinary soft nail to a point or sharp edge, harden it, and put the finished punch or chisel to use in less time than it would take to get down to the local hardware store. Some of the seemingly magic powders that are available will enable you to outperform the early crafts-

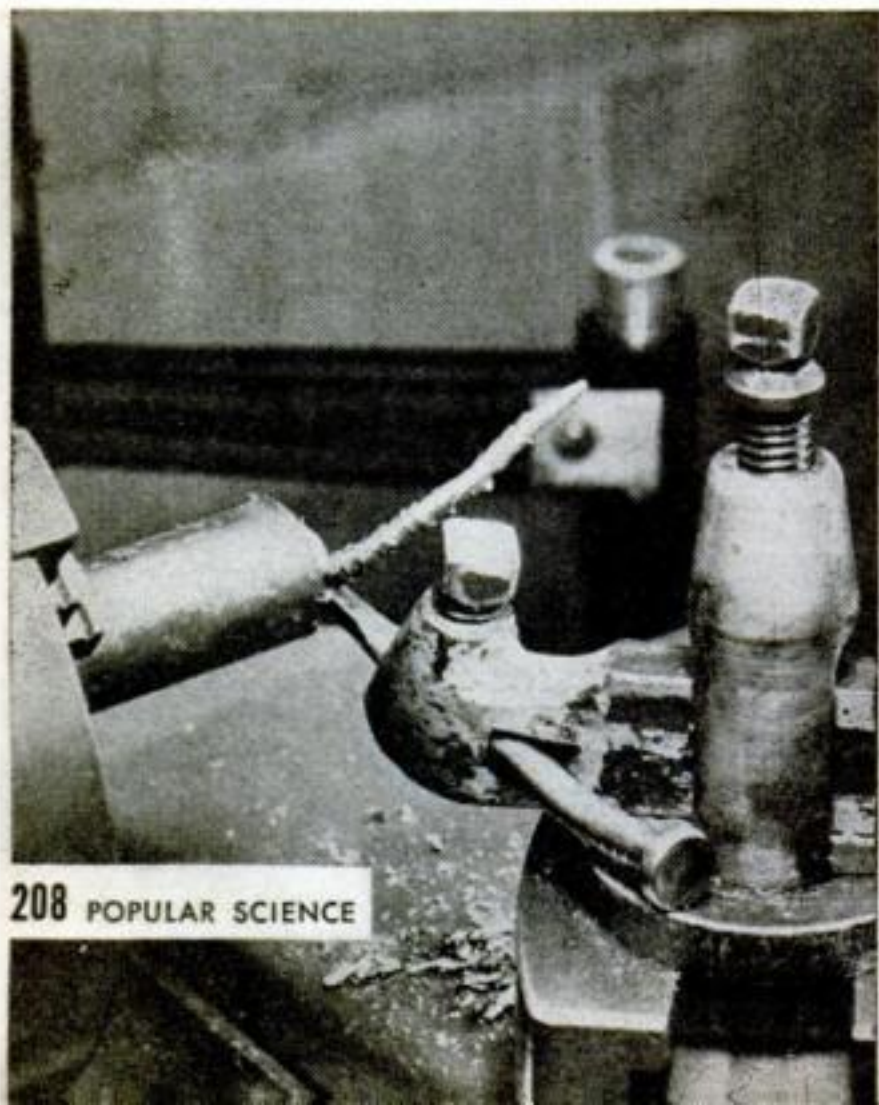
men. You can make common, soft, low-carbon steel hard enough to pierce structural angle stock—as in the picture at the top of the facing page—or harden carbon-steel drills until they will bite into an unannealed file. One of the big advantages of such case hardening is that it enables you to make special tools or parts out of cheap (and easily machined) steel and then harden them to wear like good tool steel.

Any craftsman capable of heating objects in a torch flame, over a gas stove, or in a furnace can perform miracles with ordinary steel and modern hardening preparations. Moreover, you can often improve the performance of tools or restore those that have been spoiled by overheating or grinding.

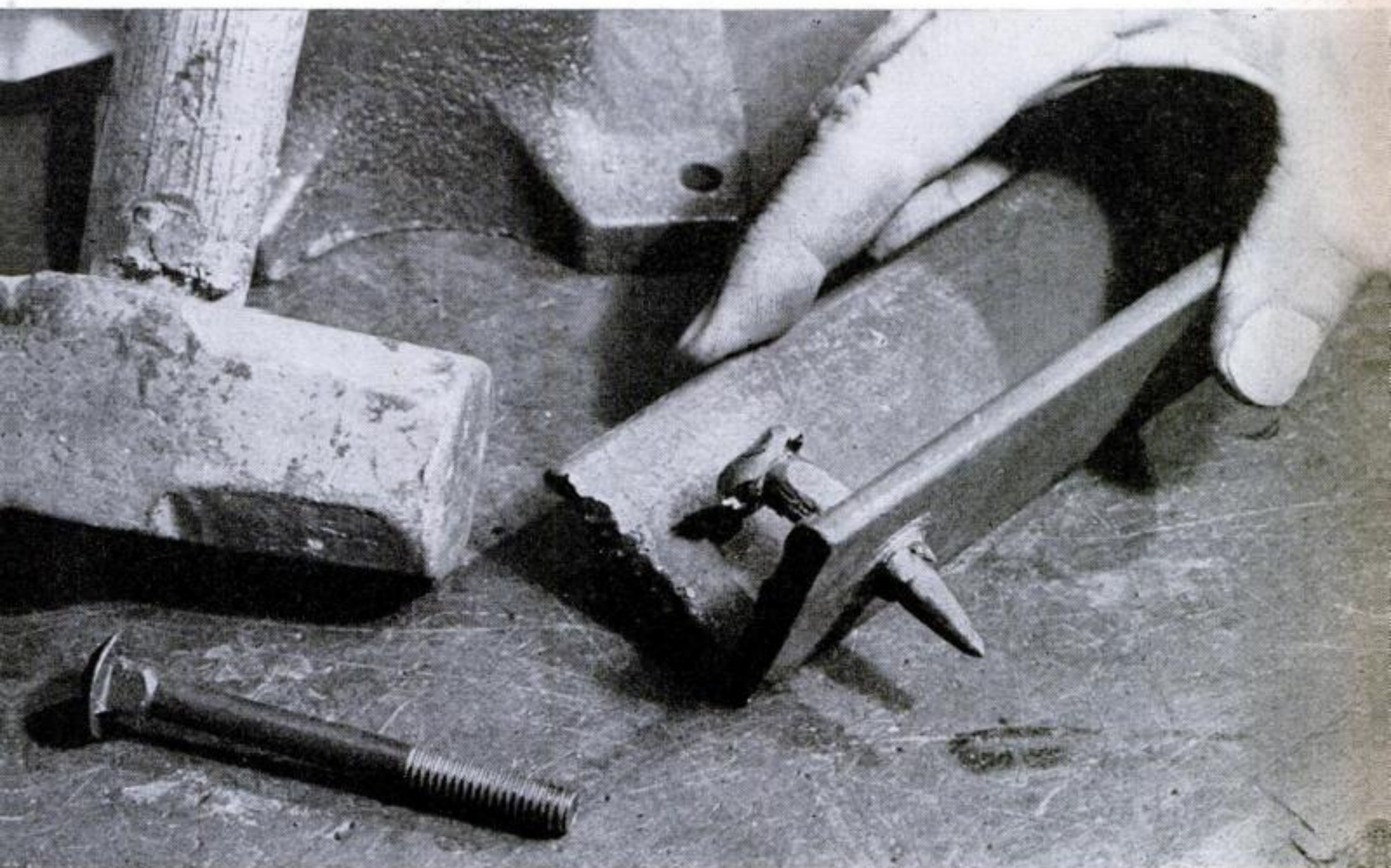
Steels may be classified into three groups: low-carbon, high-carbon, and high-speed. The first of these is a nonhardening metal used for making cold-rolled bars, and for most nails, bolts, wood screws and similar items. If you heat a piece of it to cherry redness and plunge it into cold water it comes out still soft and capable of being easily filed. High-carbon steel emerges from the same treatment too hard to file. It is used to make chisels, drills, files, and other things that need tough hides. High-speed steel, the third class, is used for lathe

The bit clamped in the tool holder here was made from a large nail and hardened with Hi-Speed-It®. That's cold-rolled steel it's turning a chip from in this photograph.

A common nail has been filed to a flat edge. It is going to become a small carving chisel. First step is to heat the tip—or the whole length—until it turns a cherry red.



Tough Hide

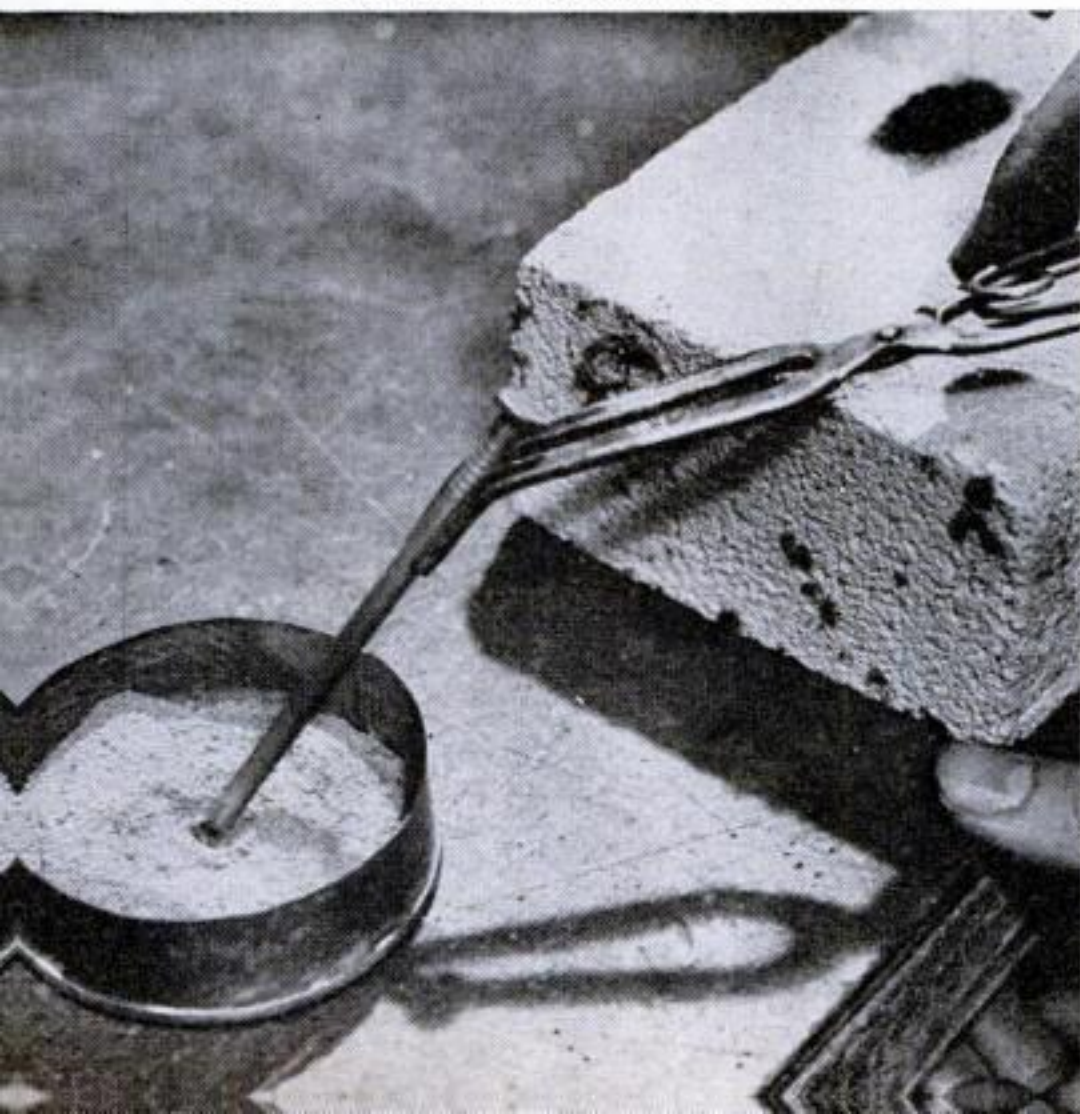


Angle iron is pierced by a punch made of a common bolt like the one in the foreground just above. No pilot hole was provided. Only the pointed end of the punch was hardened

(it was given two treatments before quenching). Note how the unhardened portion was bent, shortened, and thickened by blows that drove the punch through the metal.

Dip the red-hot metal into a tray containing the hardening powder. Remove it and let the powder fuse onto the metal for 15 to 30 seconds. Fusing stops quickly as metal cools.

Heat the tool end once more to redness and quench immediately in water or brine. You may want to experiment with motor oil, sulphurized cutting oil, or water-oil emulsions.



bits and tools that have to bite through metal and hold their temper at red heat. They are hardened by precision high-temperature heat treatment.

The first two categories differ essentially in the percentage of carbon present. By increasing the carbon at the surface of low-carbon, nonhardenable steel, you can make that surface behave like high-carbon tool steel. One of the oldest methods of accomplishing this is to heat the steel while it is in contact with something from which it can absorb carbon.

Charred bone and leather have a long history in steel-hardening lore. If you would like to see their effect, embed an object in a mass of bone fragments, leather, or both. A length of large-diameter iron pipe, capped loosely so it won't build up excessive pressure, makes a good container for small pieces and the packing materials. Heat the pipe and contents in a furnace for several hours at around 1,500 to 1,600 deg. F. Remove the work and, while it is still red hot, quench it in cold water. For better results you can let the object cool in air, reheat to cherry redness, and then quench it. The work should now have a hard case or surface .001" thick or more.

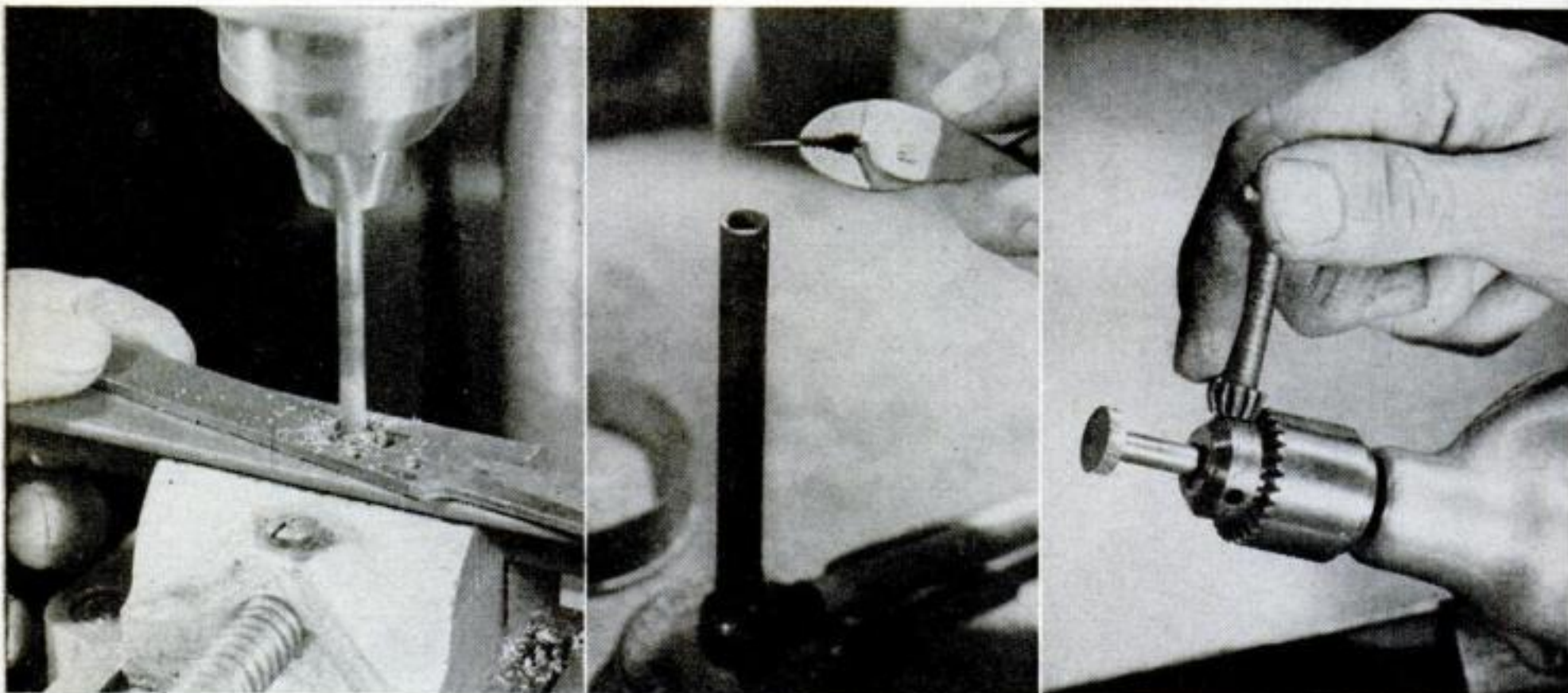
Compared with modern compounds, bone, charcoal, and leather are pretty poor carburizing agents. The newer substances contain such additional material as graphite, potassium or sodium cyanide, barium carbonate, and potassium ferrocyanide. Some of these

are deadly poisons and must be handled with great care. Numerous commercial preparations of pack-hardening compounds are on the market; they are used in much the same way as the older materials and take pretty much as long to work.

You can also buy preparations that do a similar job in minutes instead of hours. While many technicians consider that pack-hardening—the process that takes hours—is superior to the quicker method, the latter is ideally suited to the requirements of the home craftsman in that it takes a minimum of time and equipment.

Quick-hardening compounds, such as Hi-Speed-It[®] and Kasenit[®], require no furnaces or containers, and can be applied to just part of the object—such as the tip of a punch or a chisel—if you like. A typical procedure for hardening common iron or steel is to heat the work to cherry redness (about 1,200 to 1,375 deg.), and dip or roll the piece in the preparation. Some of the compound will cling to the surface of the metal. Let it fuse there—a matter of about 15 seconds—then reheat. This may take a little longer due to the insulating action of the coating. Bring it again to cherry redness, or just above the point where it no longer responds to the pull of a magnet. Quench the piece quickly in cool water or in strong salt water (brine) for maximum hardness.

Depth of the hardened case may be increased by reheating and using more com-



Even a carbon-steel drill (left), hardened as described, bites through this unannealed flat file. Center: heating the tip of a one-play phonograph needle in a gas flame preparatory

to hardening. Steel needles thus treated will play from 25 to 40 records. The rotary file with hand-cut teeth, right, was made from drill rod and superhardened.

pound. The hardening treatment often leaves the steel surface clean and bright; any clinging scale should be removed by washing or wire brushing.

Unless the cross section of the metal is very thin, low-carbon steel treated in this fashion remains soft inside. This usually makes it unnecessary to draw the hardened portions. However when the steel contains enough carbon to make it harden all the way through (a twist drill, for example), the additional hardening may make it so brittle that it will be useless without some tempering. This may generally be accomplished by heating the work until a faint yellowish or straw color appears on a bright portion of the hardened area. Remove it from the flame and re-quench it.

A common cause of failure in using some of the quick-hardening preparations is overheating the steel. Aiming for a cherry-red heat, you may get the steel yellow or white hot because of your shop lights. Too much illumination makes it difficult—if not impossible—to judge heating color correctly. Turning off the bench lights can help a lot.

Because of the shallowness of most hard cases it is advisable to file, grind, or machine the surface or edge before hardening. This also removes any decarburized metal that may have been on the surface. After hardening, the edges may be honed to maximum sharpness. It will probably be possible to touch up the edge a number of times before getting down to the soft core.

As a rule it is necessary to harden a tool only a short way back from the cutting edge, but slender tools made of soft metal may bend unless they are treated for the entire length. In hardening portions of larger pieces, it is often possible to apply the heat locally with a torch and add the compound with a brush or spatula.

Some of the ways in which surface-hardening compounds may be put to use in small shops are illustrated in these pages. Tools which take a lot of punishment can be given additional life by hardening. You can make rotary files, small burrs, special milling cutters, and other custom-job tools from cold-rolled steel. Such tools, when hardened, are particularly good for machining wood, brass, and other nonferrous materials because they hold a keener edge than high-speed steel.

Some experimenting is necessary in using the hardening preparations. When hardening ordinary carbon steel as, for example, a cheap twist drill, you will probably find that different pieces respond differently.

In most processes involving heat, steel changes its dimensions slightly. The amount of change depends upon the steel itself, the temperature, rate of cooling, and similar factors. Don't forget this when treating close-fitting parts.

Hardening compounds sometimes contain ingredients that are highly poisonous if taken internally. Although the fumes of some are said to be harmless, it is still a good idea to avoid breathing them. END

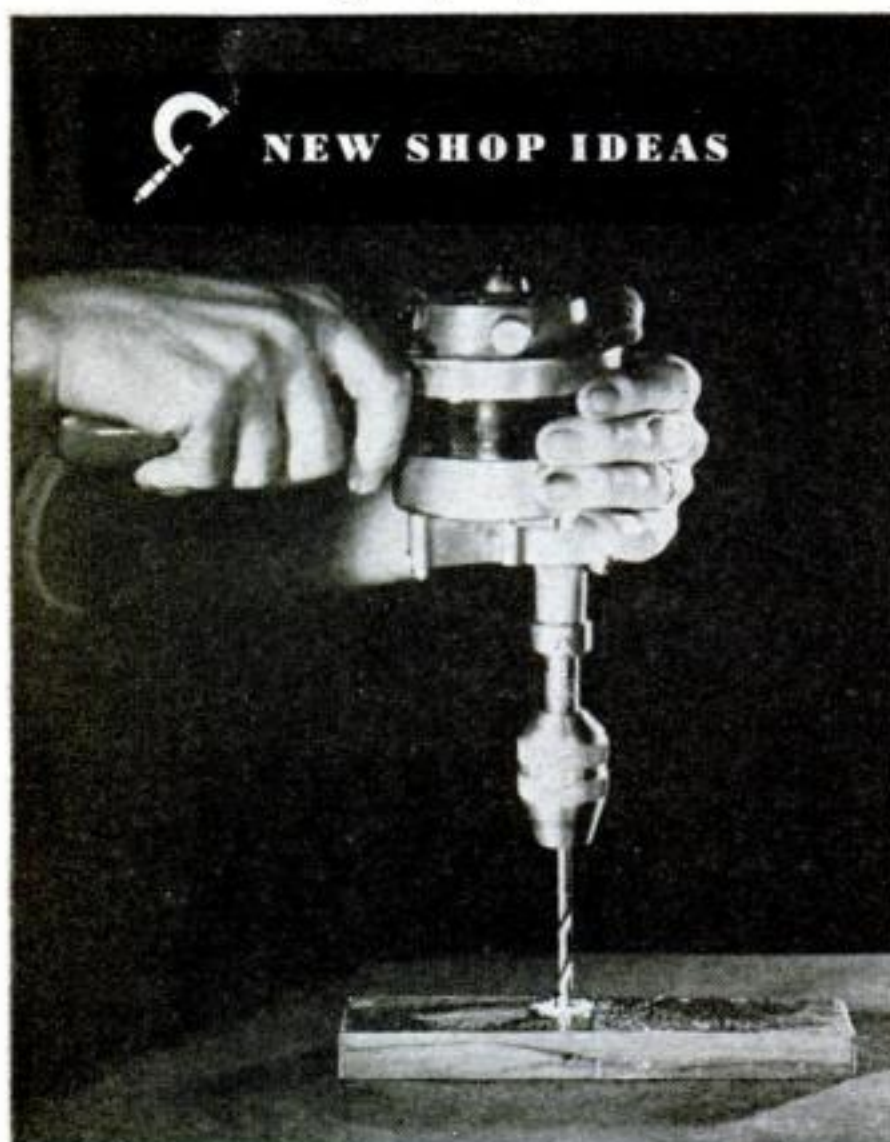


Testing hardness of a homemade concrete drill with a file. The file bites into unhardened metal only and gives a quick check on which parts are hard and which aren't.

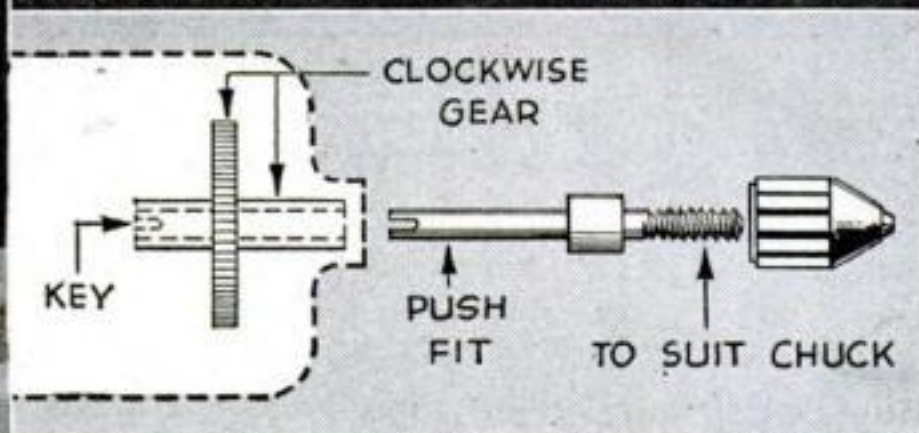
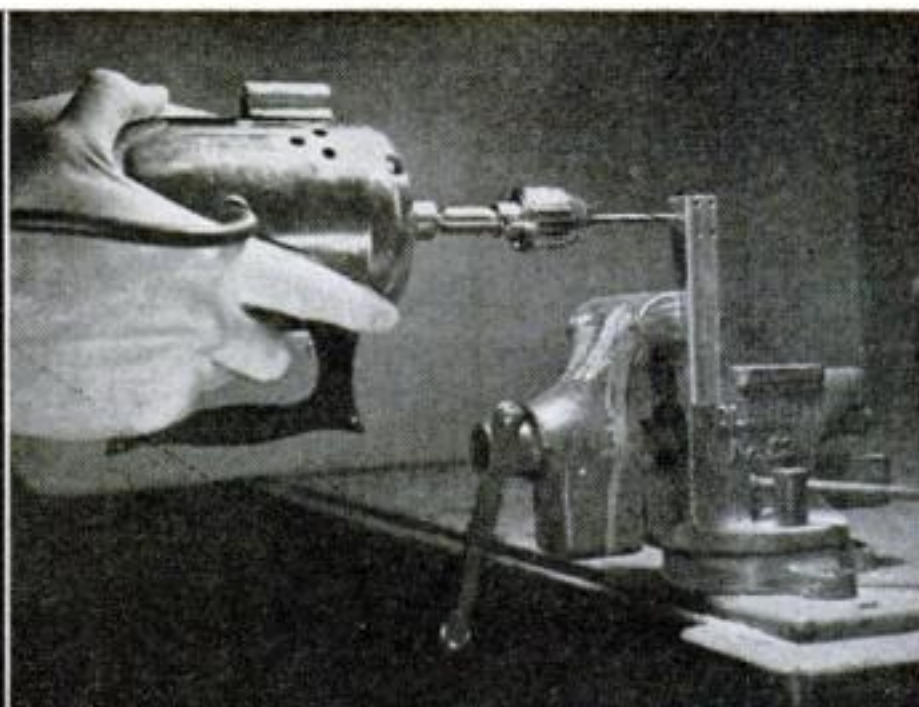


Dipping a red-hot gear into the hardening preparation. It must be moved rapidly about to bring the powder into contact with all tooth surfaces. Larger parts may be similarly treated.

4445



NEW SHOP IDEAS

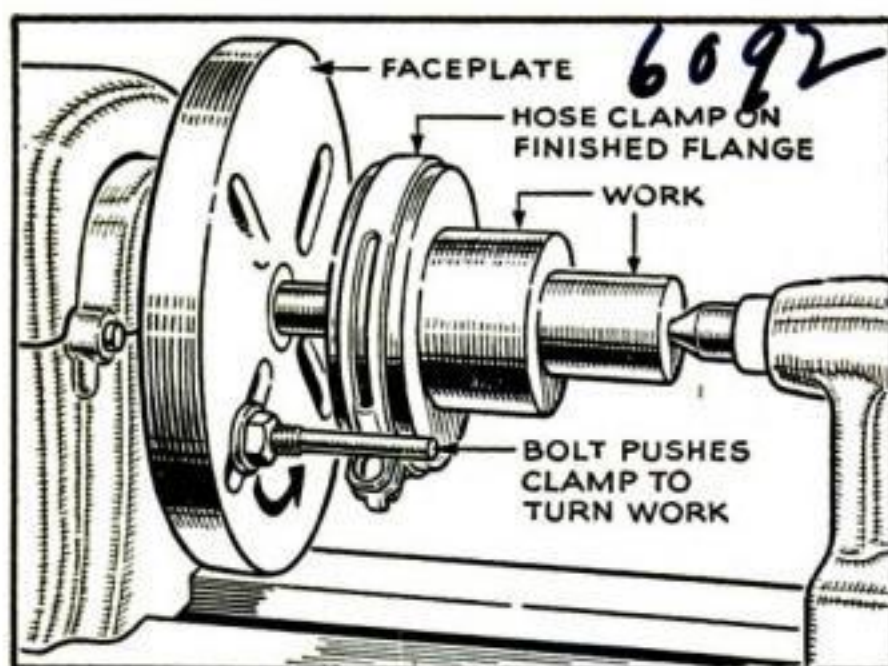


Mixer Used as Drill. Geared kitchen mixers and juice extractors make handy light-duty electric drills. The one at right above will run a $\frac{1}{4}$ " drill through steel nicely. Don't try to use a light, high-speed, direct-drive drink stirrer, which won't have enough torque.

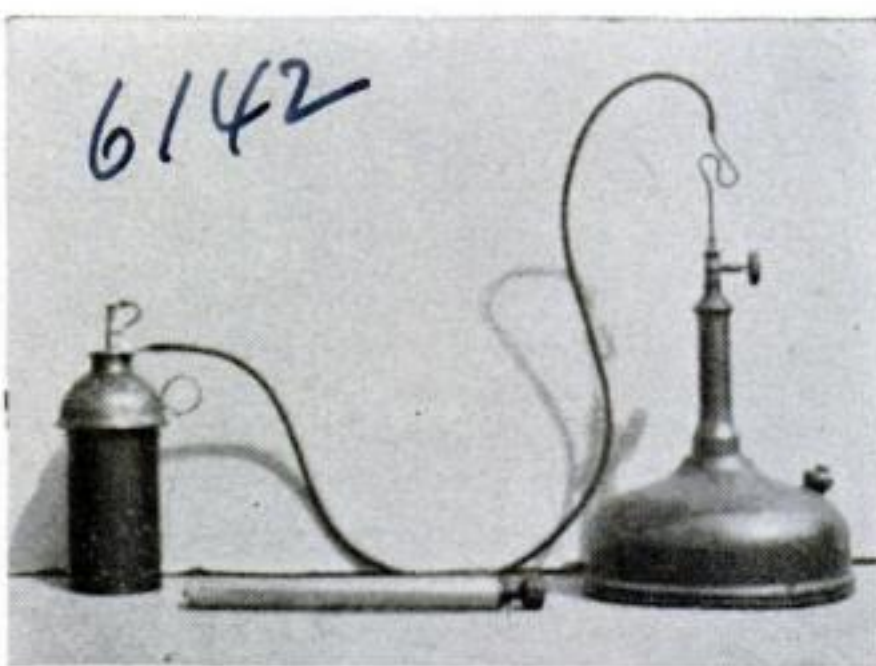
Since the drill-chuck shaft shown in the drawing is a push fit, it can be pulled out and the mixer reconverted to kitchen use at a moment's notice. Drilling thrust is taken by the gear shaft, which runs in a blind bearing. For a permanent conversion you

might want to add a ball thrust bearing, trigger switch, and pistol-grip handle.

As the two hollow mixer shafts turn in opposite directions, be sure to use the one that goes clockwise seen from in back. Drive may be through a pin, a notch, or a key in a slot. In this case, a 3" length of drill rod was turned to a push fit in the shaft socket, threaded for a drill chuck taken from a hand drill, and notched at the end for the drive key. You may be able to adapt the shaft from a hand drill and avoid threading.

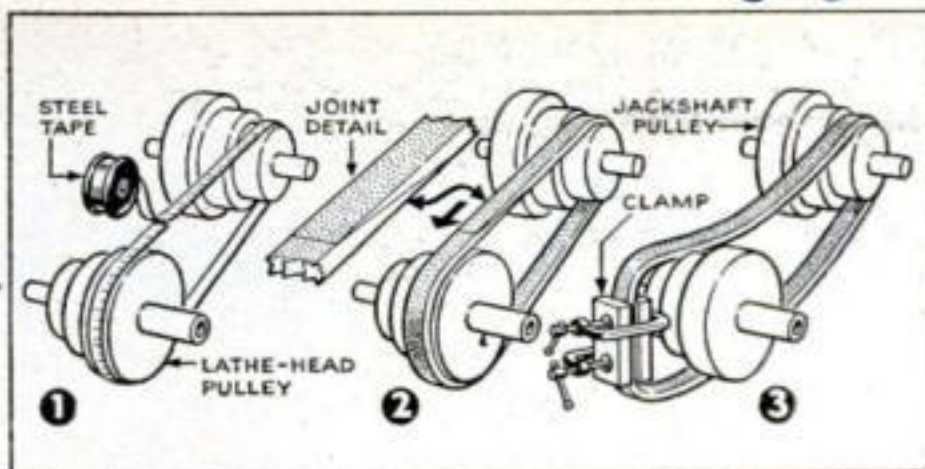


Hose Clamp Replaces Dog. For driving work with a big flange or shoulder in a small lathe, a hose clamp may be better than a lathe dog. A bolt or stud clamped to the faceplate drives it. Clamps are available in many sizes.—W.A. Welland, Victoria, B.C.



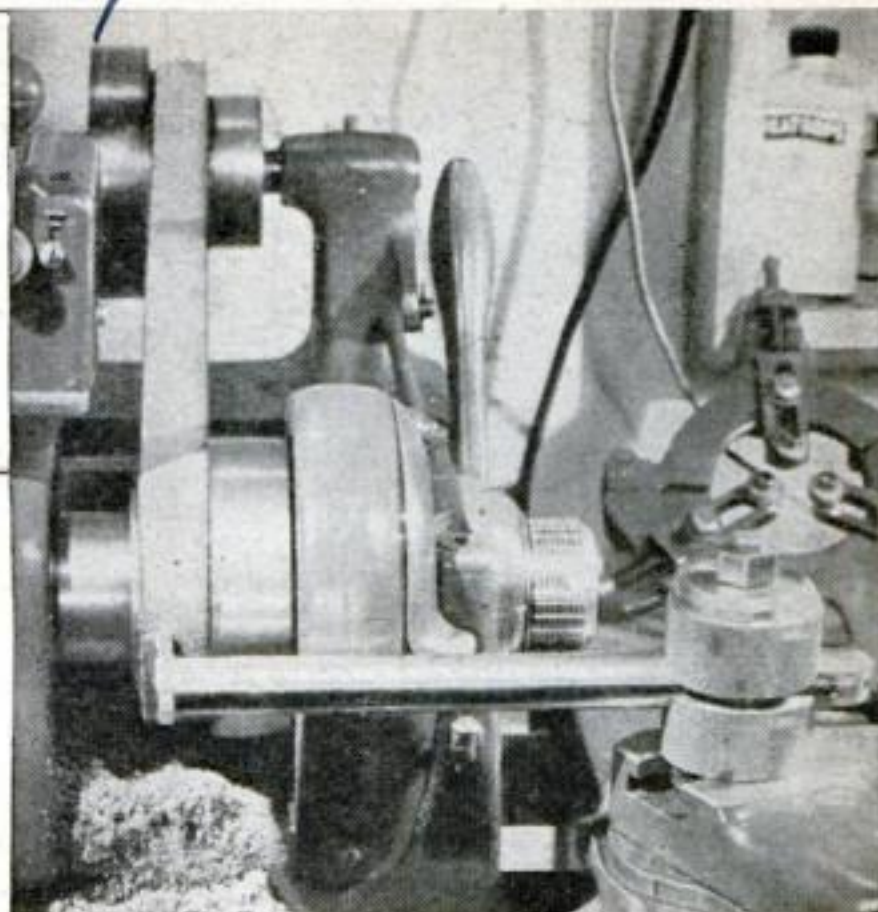
Tank Supplies Blowpipe Air. To avoid blowing into an alcohol blowpipe, I use an old gasoline lamp. The hose is hooked to the lamp generator, the tank (empty, of course) pumped up, and air regulated by the lamp valve.—R.F. Beltz, Chambersburg, Pa.

5357



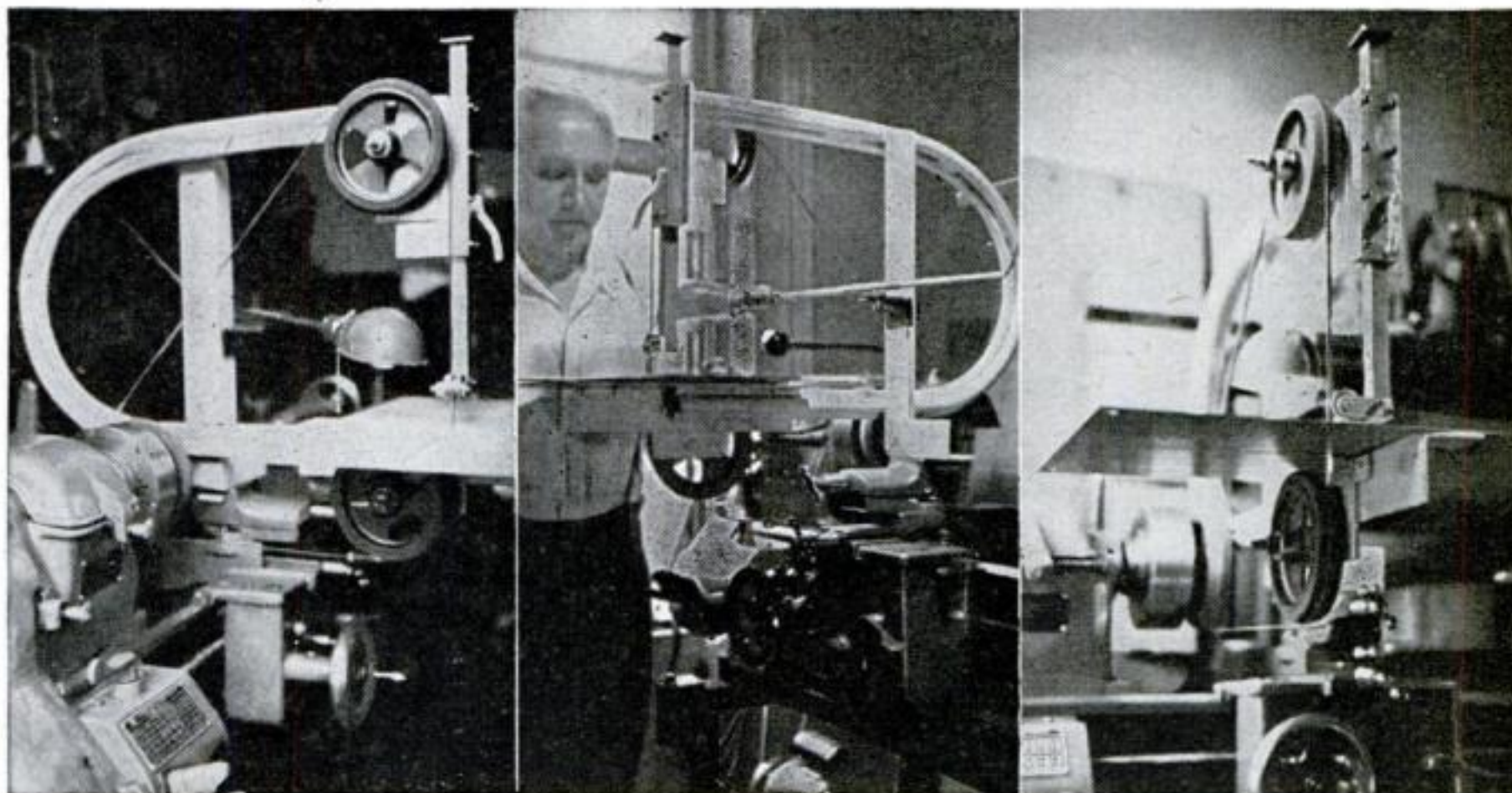
Installing New Lathe Belt. Renewing a flat belt on a lathe is a simple job but calls for careful work. The modern cemented joint is easy to make and holds well. Measure the length over pulleys as in Fig. 1, cutting the belt 4" longer. Then skive both ends (form a long bevel) for a distance of 4". Note the direction of the joint in Fig. 2, and in skiving remember that the smooth side goes against the pulleys.

Secure one end to a block of wood with brads that can be pulled out after the splice is made. Loop the belt around both pulleys. Apply good-quality cellulose cement and let dry; then apply a second coat. When it's tacky, assemble and clamp the joint with a



second block as in Fig. 3. Let dry overnight.

You can dress the belt to uniform thickness and trim any unevenness at the joint with a boring bar as in the photo above. Run the belt on the middle pulleys and use a slow carriage feed from left to right.—H. L. Phillips, Watertown, Mass.

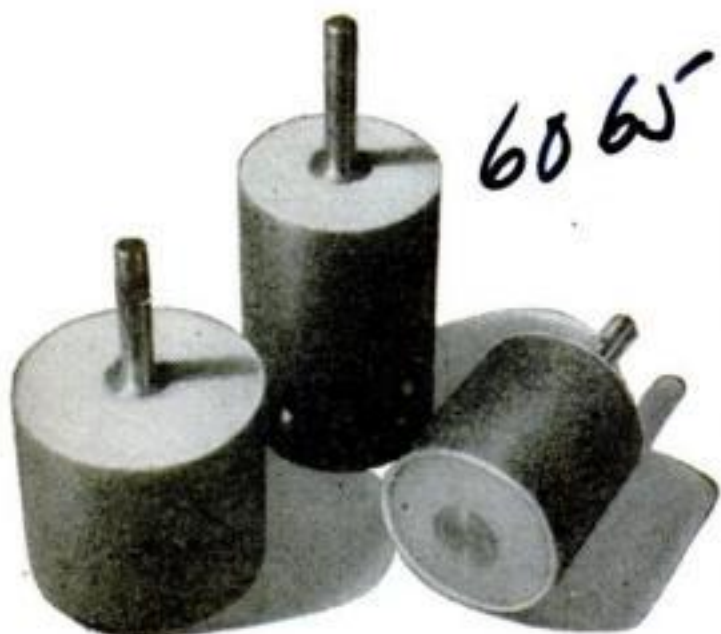


Lathe Drives a Bandsaw. The drive wheel of this detachable bandsaw is chucked in the lathe on which it's mounted. Any lathe speed is therefore available for sawing metal, wood, or plastics. The saw cuts to center of a 26" circle and handles up to 6" stock.

Alois Steiner, of Hoboken, N. J., inventor of the device, has applied for a patent to protect manufacturing rights, but thinks PS

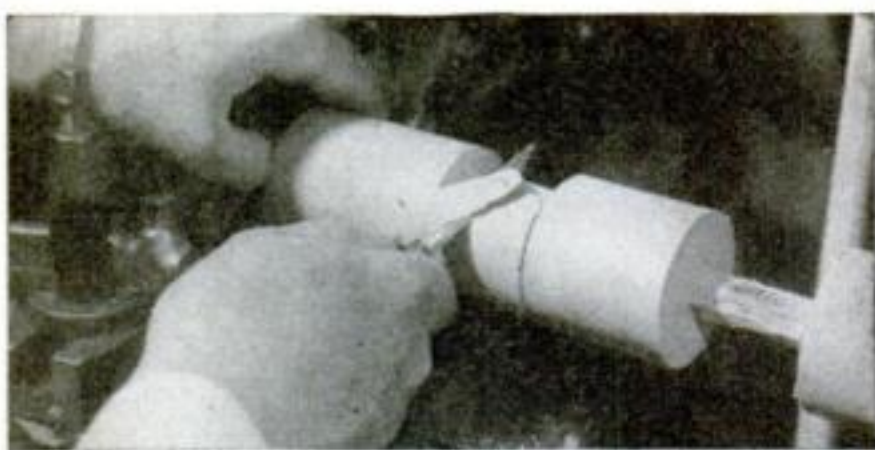
readers may wish to build similar machines for their own use. His has a frame made of three lengths of $\frac{1}{2}$ " pipe spot-welded at 5" intervals. It bolts to the compound rest, and blade tension is adjusted by the lathe cross feed. Pulleys are faced with soft rubber and crowned. The blade guide is a roller bearing fitted with collars that form a groove in which the blade tracks. A guard (removed here) should be fitted to protect the user.

6161



Sanding Drum Cut from Washing-Machine Roller

Pick the drum you need. With several on hand, you can fit each with different grit and so avoid changing sleeves.



Remove waste rubber with a sharp knife after cutting the drums to lengths that you prefer.



Reduce the drums to the desired diameter with abrasive cloth attached to 12" piece of wood.



Turn down roller shaft to make suitable drum shanks. The ones shown measure 5/16" by 1 1/2".

IF THERE'S a shortage of drum sanders in your shop, you can overcome it at practically no cost. Just beg, borrow, or rescue from the scrap box one or more used washing-machine rollers. From these, you can make drum sanders of any length and any diameter that's less than the actual diameter of the roller. This is usually 2 1/4". Depending on the length, a roller will yield two to four drums. It's wise to pass by any on which the rubber is badly split or deteriorated.

Centerdrill the roller and mount it between centers in the lathe. Then cut the rubber into drum lengths. Allow for shanks between the drums, plus 1/4" or so for finishing the ends.

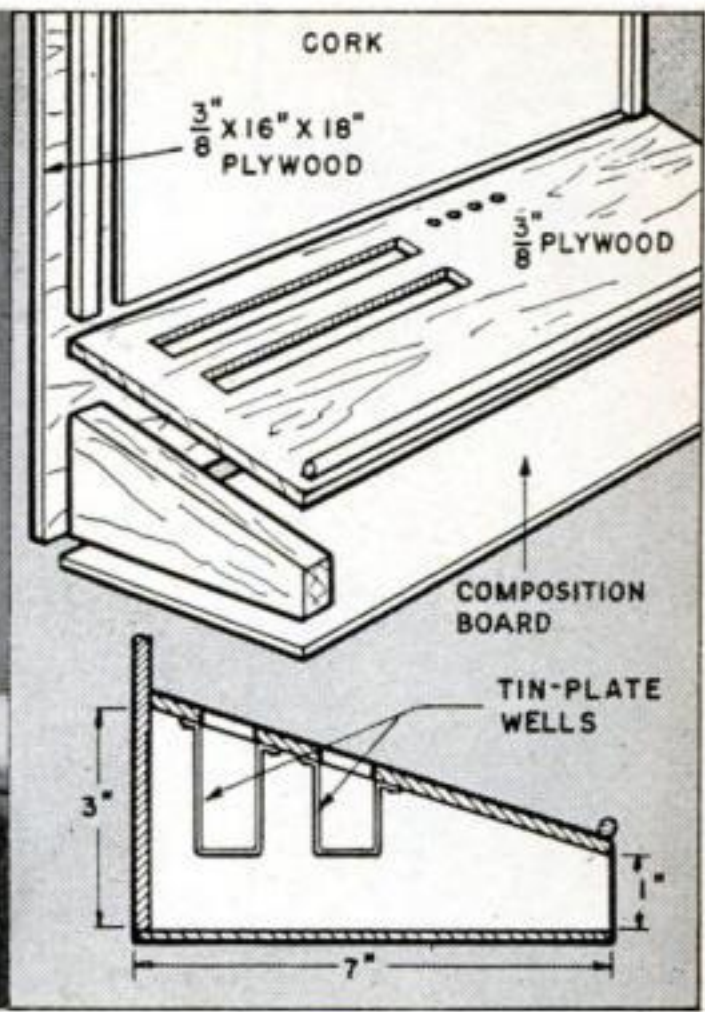
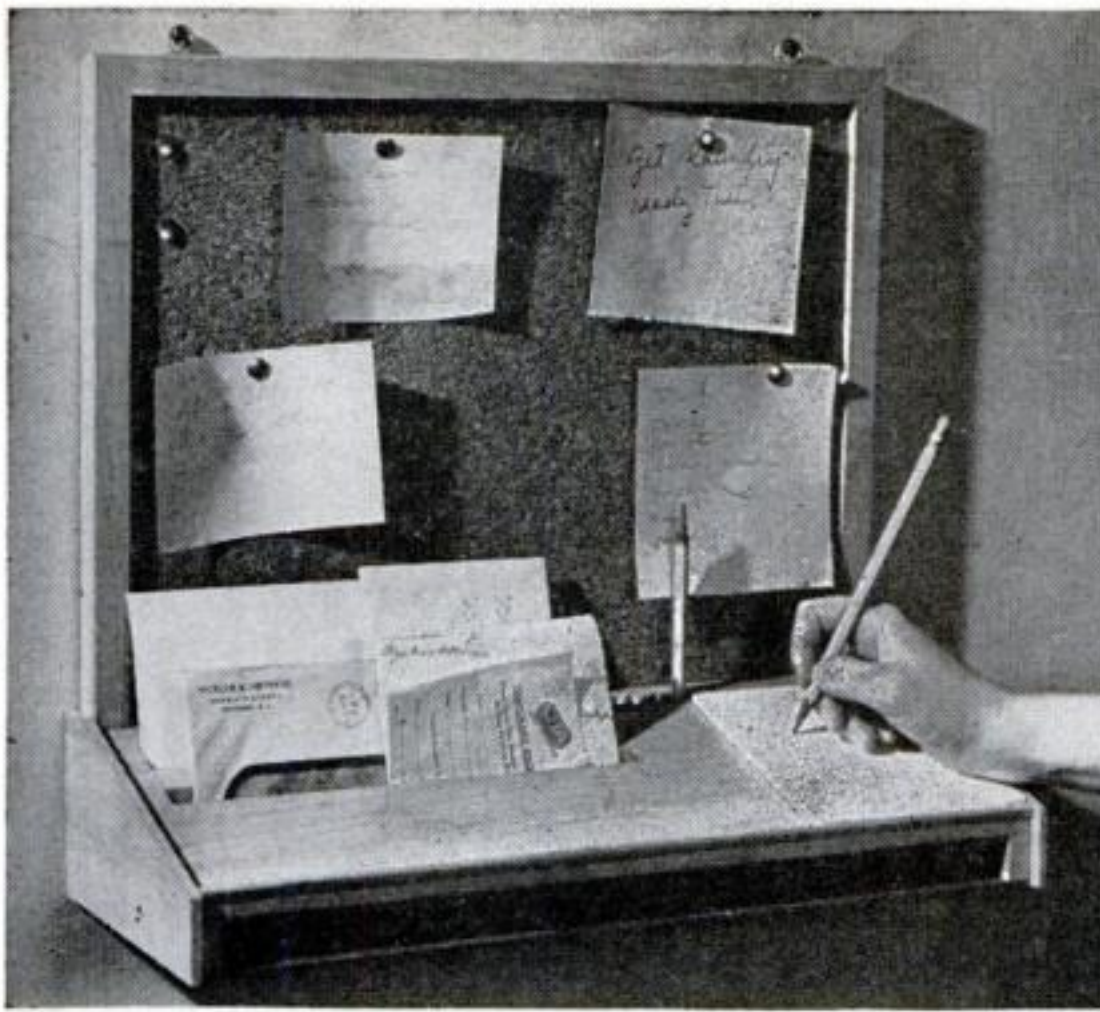
Bring the drums to the desired diameter with abrasive cloth tacked to a 12" piece of wood about 2" wide. Have one side coarse cloth (about 40 grit) and the other fine (about 80) for finishing. Operate the lathe at high speed. Test the drums with calipers frequently to assure uniform diameter the full length of the drum.

After finishing the drum ends, turn the roller shaft to a suitable diameter, depending on the use to which you intend to put it. The drums shown here have 5/16" by 1 1/2" shanks to fit a drill-press lock-on chuck.

Now cut the drums apart and face the bottom of each in the three-jaw chuck. You may wish to relieve the shaft end slightly with respect to the rubber. The top of the shank may be smoothed with a grinding wheel and abrasive cloth.

Abrasive sleeves can be attached to the drums with rubber cement if necessary.
—Will Thomas, Kenmore, N. Y.

3495



Family Message Center Routes Mail and Memos

A COMBINATION bulletin board, mail desk, and memo pad, this home message center rounds up all those stray shopping lists, letters, and don't-forget notes in one prominent spot.

The pint-size wall desk is another PS Practical Solution designed by the Editor for his own use. It is constructed mostly of plywood and hangs conveniently near the front door. The slanting front has two 10 $\frac{1}{4}$ " slots

(marked "IN" and "OUT") to hold mail or telegrams, and four vertical holes for pencils. Tin-plate wells in the slots keep small envelopes from the space below. The space below the writing surface is a shelf 1" high by 6" deep, for extra paper or note pads, timetables, and magazines.

A sheet of cork on a plywood back provides a 12" by 16 $\frac{1}{2}$ " area for notes and shopping lists, pinned up by thumbtacks.

Sprayer Uses No Compressor



A NEW type of electric sprayer that operates on the vibrator principle has been announced by Burgess Battery Company, Handicraft Division, Lake Zurich, Ill. Called the Vibro-Sprayer®, the device uses no compressor or motor and works on any 115-volt AC line. It is particularly adapted for jobs where portability

is a factor, since it is completely contained in a single hand-held unit weighing slightly over 1 lb. It is said to be suitable for paint, lacquer, enamel, insecticide, light-oil and similar sprays, but is not designed for use with water-base liquids. Retail price of the spray is about \$10.



Paint Spray Is Foot Powered

THIS versatile spray outfit is made more versatile by a number of interchangeable parts. Manufactured by Cesco Products, Inc., Chicago, the basic unit includes a foot-operated compressor, a triggered handle, and two paint containers, each with its own spray head. The handle slips onto either, making it unnecessary to clean them when switching colors or coats. Price is about \$10.



PHOTO IDEAS AND EQUIPMENT



Gadget Aids Print Washing.

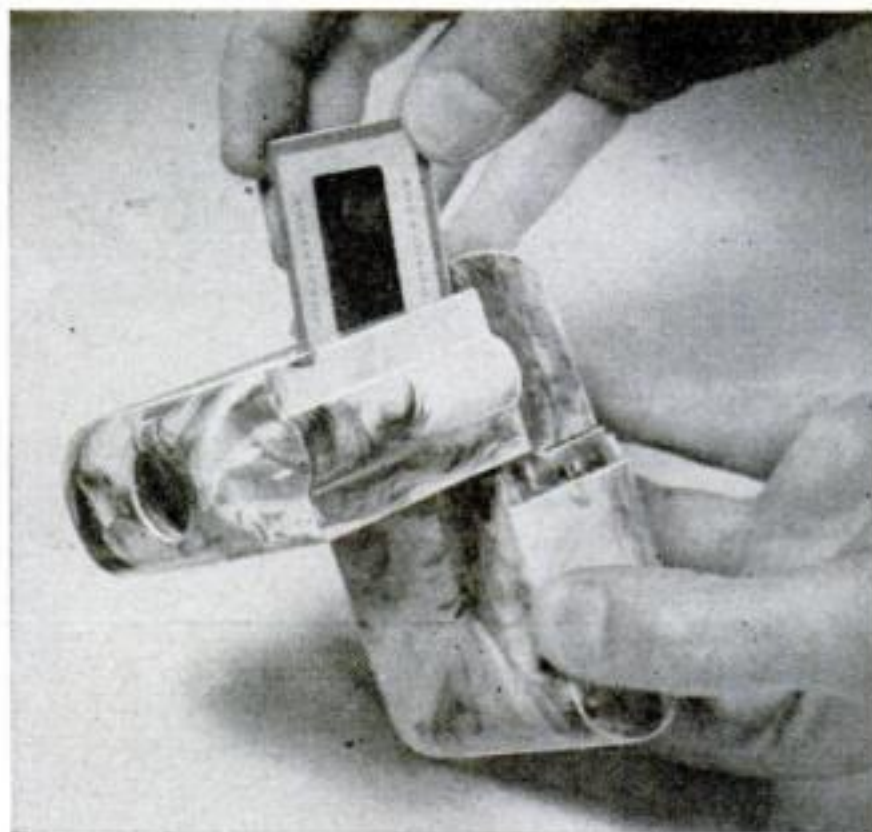
Connected to a faucet, this homemade washer sprays out 16 streams that agitate and separate washing prints. Plastic strips $\frac{1}{8}$ " thick and 1" wide are heat-shaped and cemented together to make the holder. The

tube, which is about $\frac{7}{16}$ " o.d. with a $\frac{1}{16}$ " wall, has holes $\frac{3}{8}$ " apart made with a No. 53 drill. In use, the holder is snapped over the edge of a pan with a wedge under the opposite side of the pan so the overflow is toward it.—B. C. Hamilton, Brookline, Mass.



New Lamps Have Many Uses.

Two multipurpose flood reflectors, adjustable from over-all lighting to a spotlight beam, are announced by Eastman Kodak Co. Focus is changed by rotating the socket. The 12" aluminum reflectors take No. 2 flood lamps. One, above, is mounted on a C-type clamp and sells for about \$10. The other is mounted on a stand that telescopes from 3' to 5½'. Its price is about \$15.

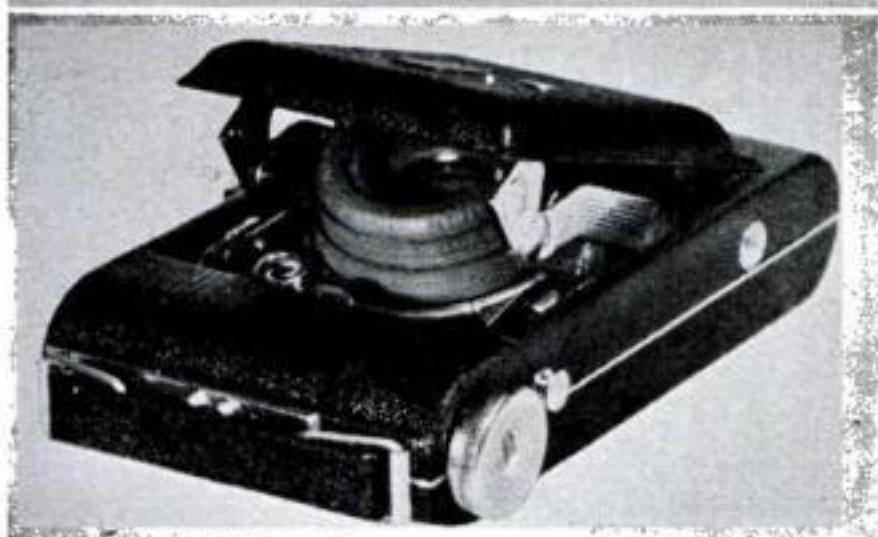
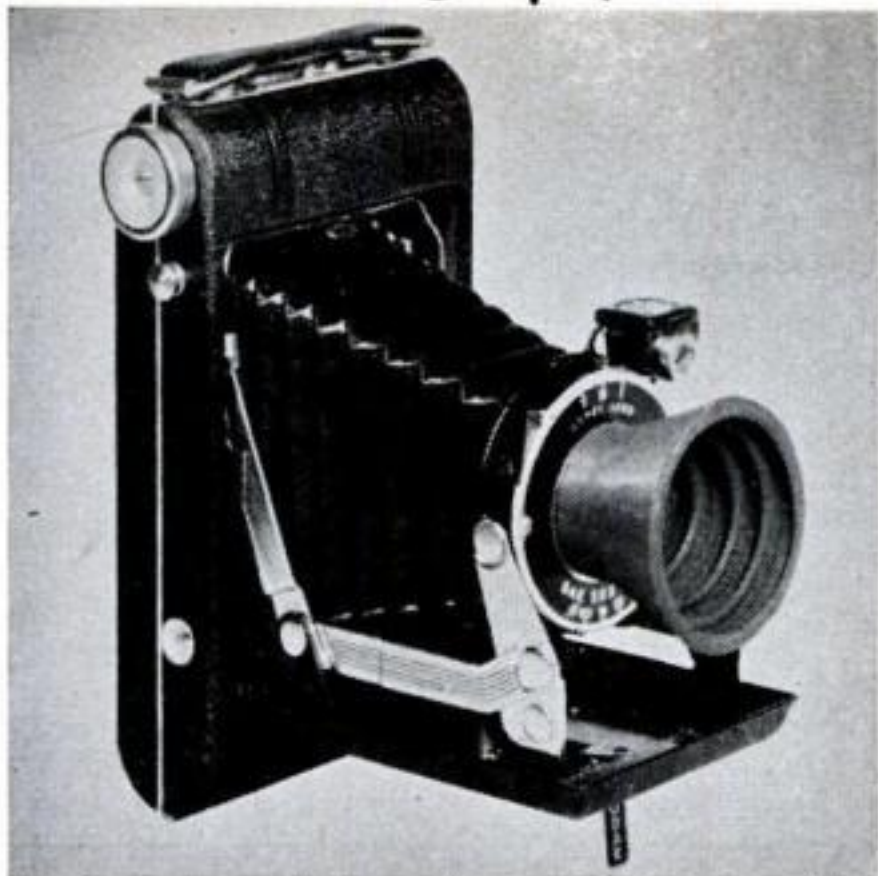


35-mm. Viewer Fits Pocket. The top part of this plastic case slides up and folds forward for viewing film slides. Closed, it is compact enough to slip easily into a pocket. Two flashlight cells supply light, and a focusing magnifying lens is provided. At one side is the push-button switch, covered when the case is closed. Arcadia Manufacturing Co., Chicago, makes the viewer to retail at about \$4.50.

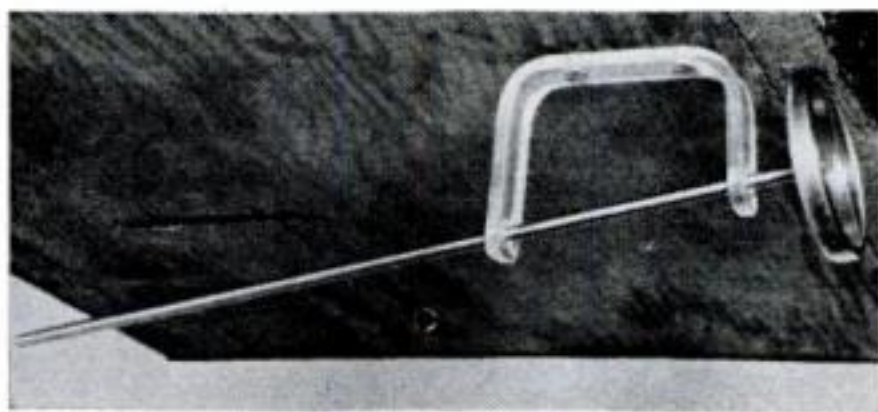
5449

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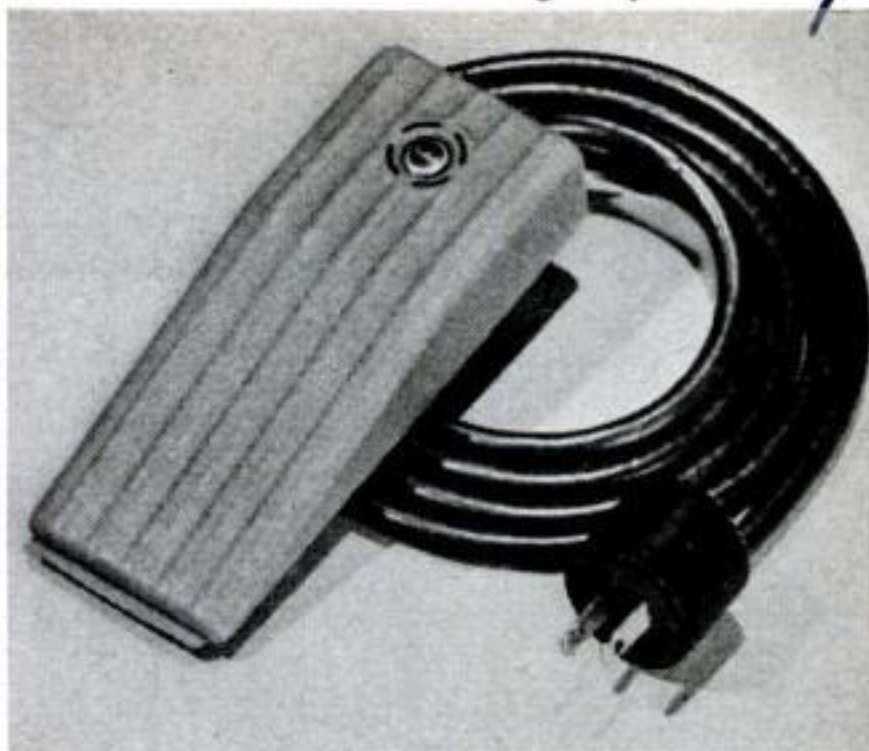
Lens Hood Folds Up. This combination rubber lens hood and filter holder is left in place and just rolled back over the lens mount when the camera case is closed. It comes in only one size but is made to fit various lens sizes by trimming off marked sections of the smaller end. The maker is Wheeler Enterprises, New Augusta, Ind.



Bracket Holds Thermometer. Strips of $\frac{1}{8}$ " thermoplastic, bent and drilled, form undershelf or wall brackets for photo thermometers or stirring rods. Heat the plastic in boiling water and bend it over the edge of a table before drilling it. Then countersink the attaching screws and bevel both edges of the holes so the thermometer will slip through easily.—Jack Wilson, San Pedro, Calif.

5481

5427



Footswitch Glows in Dark. A built-in neon lamp enables a darkroom worker to locate easily the Eastman Kodak Company's new footswitch for enlargers, printers, or other photo equipment. Incorporating a snap switch, the unit also may be mounted on a table leg or wall for operation by knee pressure. Bayonet slots are provided in the base for this. The switch, for AC only, will carry up to 1,000 watts.



Less Solution Required. Directions provided with the tank shown above suggest loading film vertically. However, smaller film sizes can be placed horizontally just as well. With $2\frac{1}{4}$ " by $3\frac{1}{4}$ " cut film, this has the advantage of requiring less than a quart of developer. It's more economical and convenient to keep just a quart on hand than the larger amount for vertical development specified by the manufacturer.



Reach out with your camera
to get big, detailed pictures
from far away. Here's how to do it.

5108 Telephoto Rig Brings 'Em Up Close

HERE'S an inexpensive substitute for a telephoto lens. What it does is pick a small area from what was intended to be a long-focus 4" by 5" field, confining the image to a 1 1/4" by 1 1/8" film frame in a pocket-size camera. Compared to the tiny image produced by the original camera lens, you wind up with whopping magnification, some 6 1/2 diameters with the setup shown.

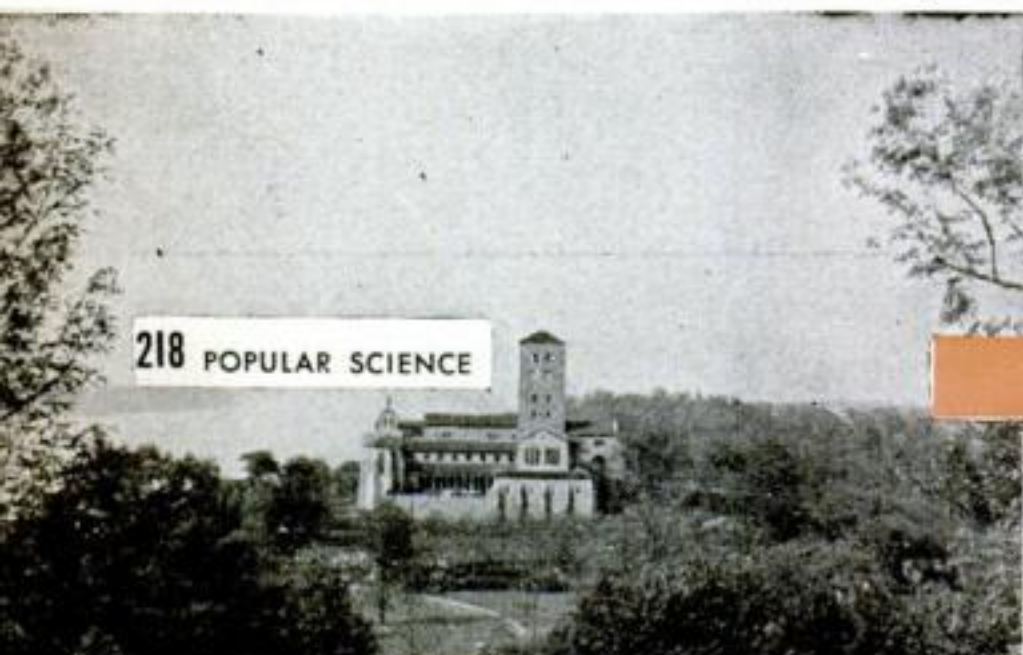
The rig was assembled around an old two-element Plastigmat lens of 5 1/4" focal length, the front element (lens) being removed. It

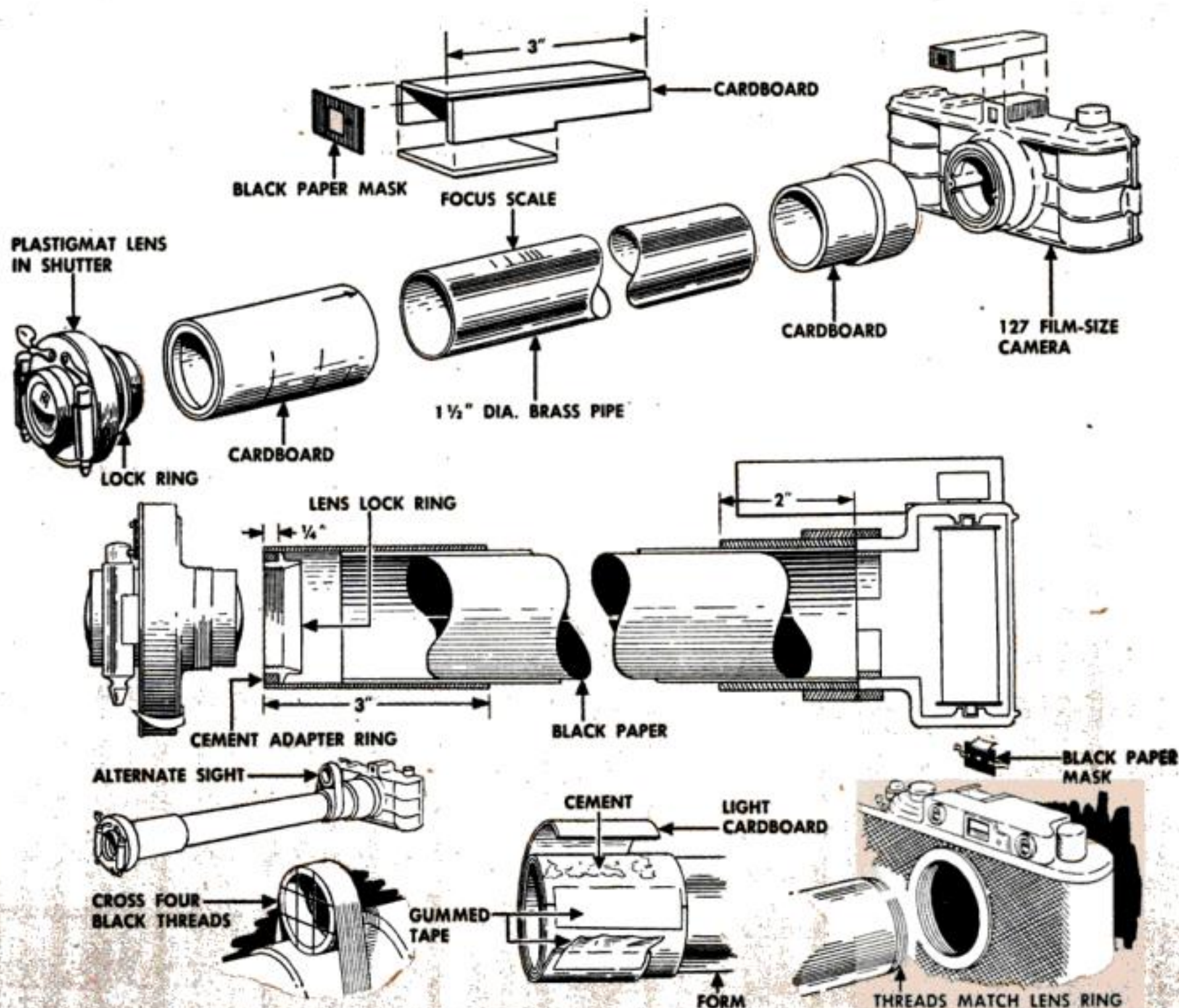
was already mounted in a shutter. With a little experimenting, you may find other old lenses that will perform similarly. After removing the front element, I found that the rear element alone cuts a crystal-clear image at a full 14". That's the secret. Mount it 14" away, not from the 4" by 5" frame for which it was intended but from a half-size 127 film frame.

You need only two things to do this—a lens tube and one of the inexpensive cameras that gives 1 1/4" by 1 1/8" negatives on 127 film.

Here's an example. Both of these photos were taken with a Leica at a distance of 500', the

one at left with a standard Leica lens, the one at right with the telephoto rig described here.





An old-fashioned lens, a tube, and an inexpensive camera are the major elements required.

Since the camera serves only to transport the film, you won't need the lens and shutter assembly. Don't worry about a diaphragm, since you shoot at full aperture all the time.

For the tube, get a 12" length of 1½" brass drain pipe. At either end of this, you'll need an adapter tube, one to fit the brass pipe to the camera and another to mount the lens. If you don't have a lathe, build up these adapters by fitting together several layers of cardboard with tape and cement.

In the front end of the lens-adapter tube, cement a cardboard ring to retain the lens lock ring. This adapter slides on the metal tubing for focusing. Black paper inside the tubing prevents light flare.

Should you start with a lens of different focal length, it will be necessary to experiment to determine the proper length of the tube. The important thing is to locate the lens as far as you can from the film.

It's easy to adapt the idea to a Leica, for a length of standard 1½" nickel-plated drain tubing threaded on one end precisely

matches the threads in the Leica lens ring. The inset photo at the top of the facing page shows my own Leica so equipped.

To establish and mark focus points on the metal extension tube, mount the 127 camera rigidly and place a ground glass in the film plane. Focus on a really distant object for the infinity setting, scribe its position, and do the same for 500', 200', 100', and 50'.

On the Leica and some other cameras you can't readily install a ground glass. Lick this by fixing the camera rigidly and taking a series of test shots, making temporary nicks in the tubing to correspond with each. Compare the resulting photos and permanently scribe the points that give best focus.

You'll have to cut down the view finder to match the distant scene that's going to reach the film. This may be done by any of the three methods illustrated.

You may find that your frames will be rounded off somewhat at the corners because the tube diameter cuts down on the field.—Henry Clark, Saratoga, N. Y.

5361

Shadowless Lighting

FOR SHADOWLESS closeup photos of mechanical parts, jewelry, and other small objects, try aiming your camera lens through a bright circle of light.

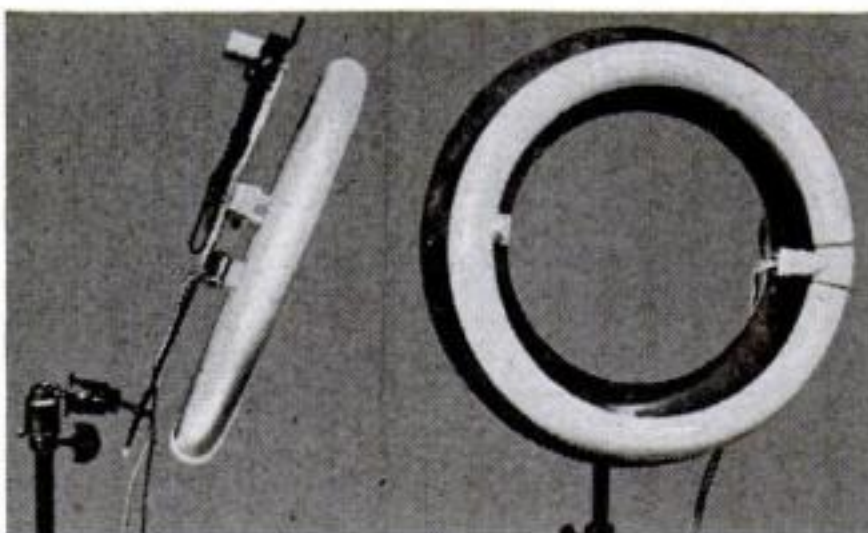
By altering a circular fluorescent lamp and mounting it on a flat aluminum ring, I made the handy table-top light shown here. The ring was cut from $\frac{1}{8}$ " stock and has an 8" i.d. and a 13" o.d. However, the supporting ring can be made of almost any fairly rigid material, since the fluorescent tube doesn't weigh very much and you won't have to worry about the lamp generating enough heat to harm the ring.

The sockets of a circular tube are mounted at the ends of a transverse piece across the center of the circle. Cut off the ends of this piece and remount them on the aluminum ring. Then mount the starter on the rear of the ring. The ballast for the light can be located anywhere. I placed it at the bottom of the stand near the floor, but you can fix it near the wall socket or use a combination plug and ballast.

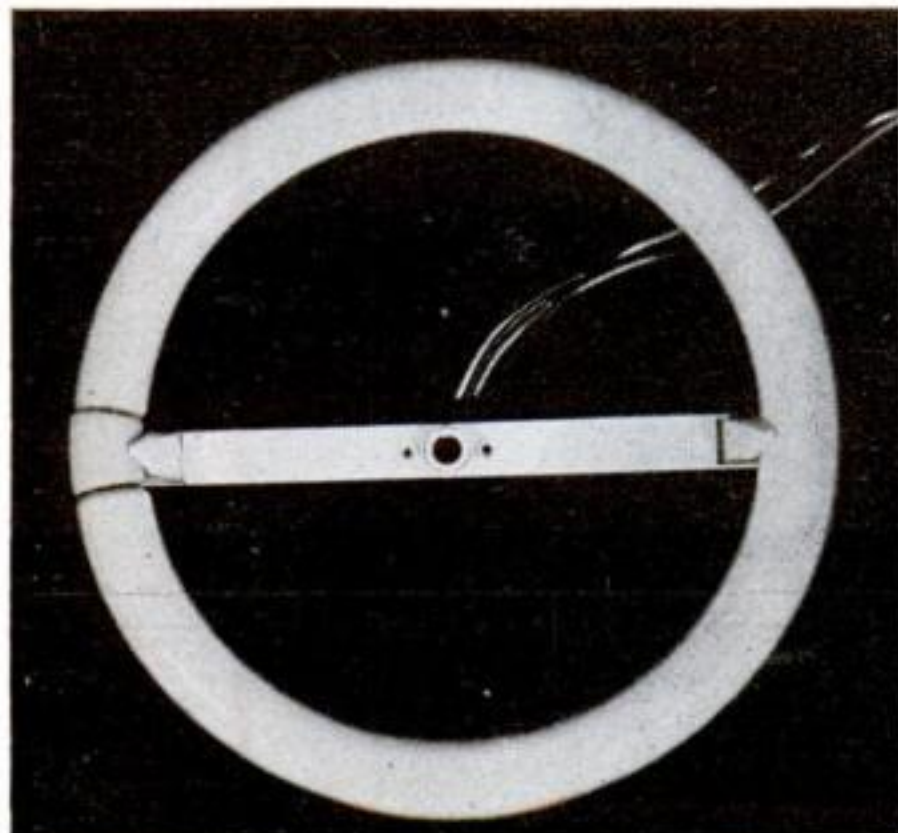
To support the lamp, I used an ordinary light stand equipped with tandem swivel heads for greater flexibility. Set the camera lens and the object to be photographed on a line that passes through the center of the circular lamp.—A. H. Honest, Bronx, N. Y.



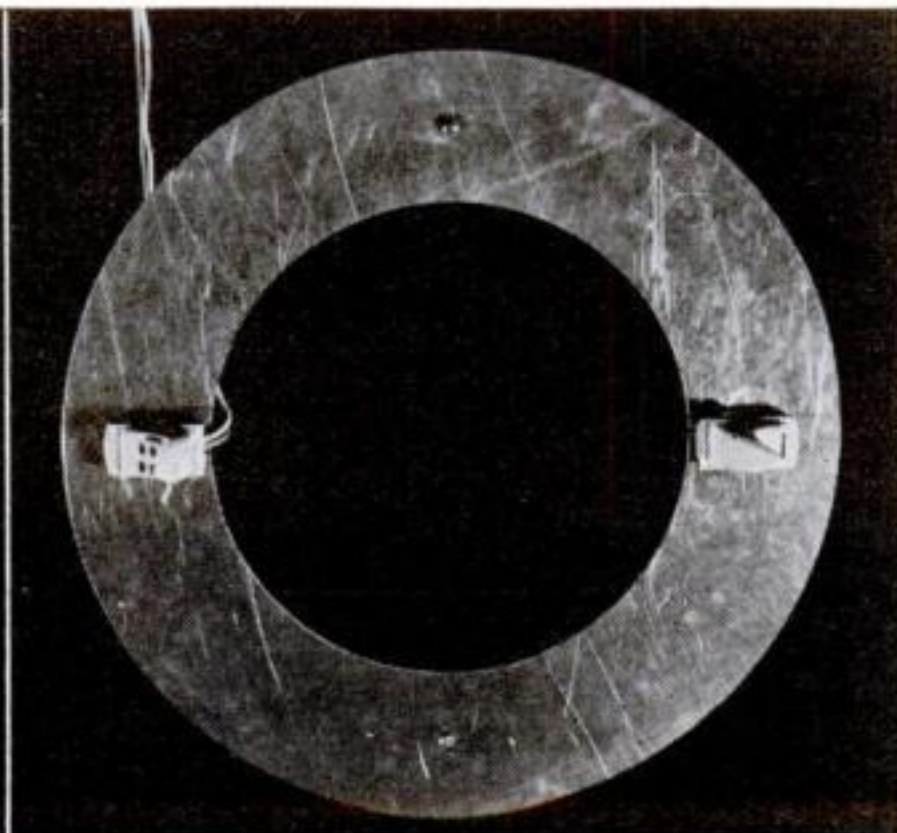
Here's the setup for shooting with the circular lamp. You could attach curved reflectors around the outer circumference of the ring, but the arrangement pictured works fine without them.



Side and front views of the completed lamp. The starter is mounted on the upper rear part of the ring. On this lamp, the ballast is located at the bottom of the stand.

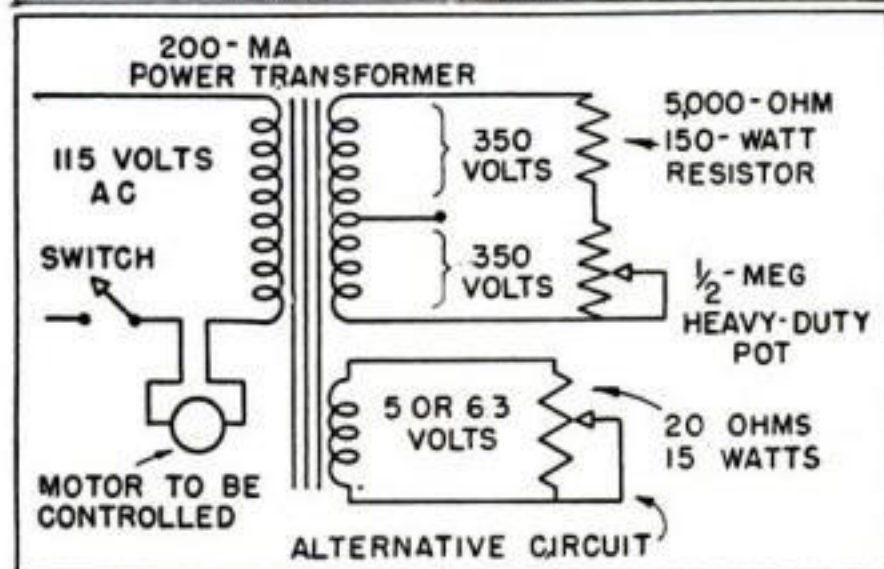
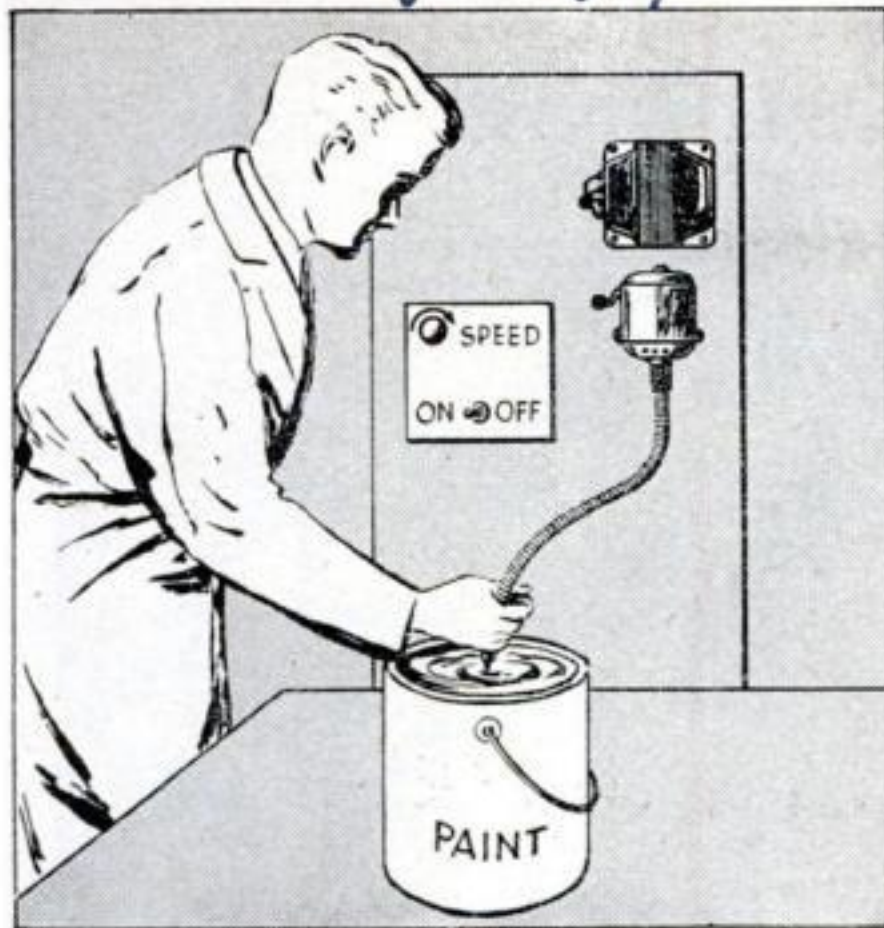


To make the circular lamp, cut the ends off the fitting that runs across the middle of the



fluorescent tube and remount them on the aluminum ring, as shown in the photo just above.

71094



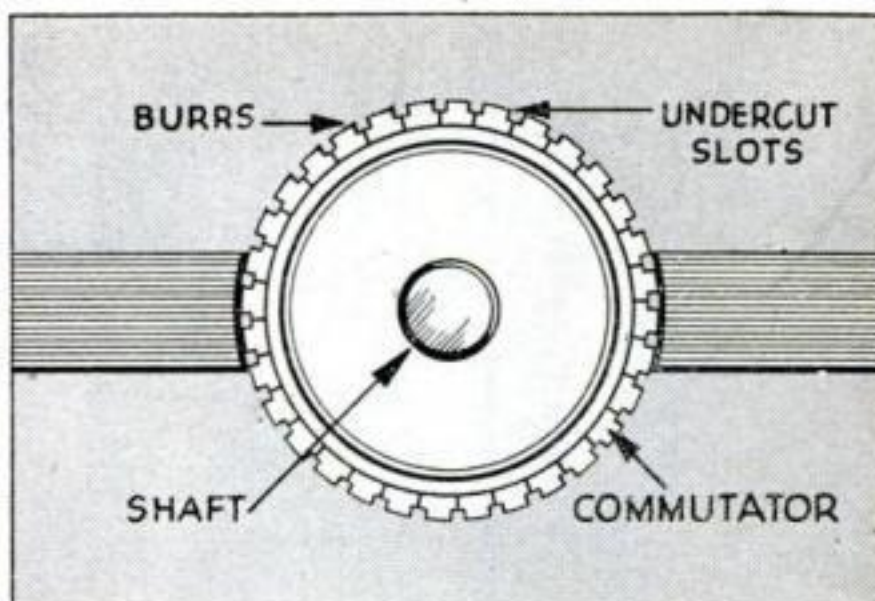
Transformer Regulates Motors

OLD motors taken from discarded vacuum cleaners, hair dryers, kitchen mixers, and the like can be put to good use in the shop. But an effective speed control is often indispensable. One solution that can be applied to small universal AC-DC motors and even the 24-volt DC type is shown above.

When there is no load on the secondary of a transformer, practically no current flows in the primary. Thus, by connecting the motor in series with the 115-volt line and the primary, you can regulate its speed by means of a variable resistor across the secondary. This may enable you to use a rheostat or potentiometer that you couldn't connect directly in the motor circuit itself (it must of course be of a rating to carry the secondary current).

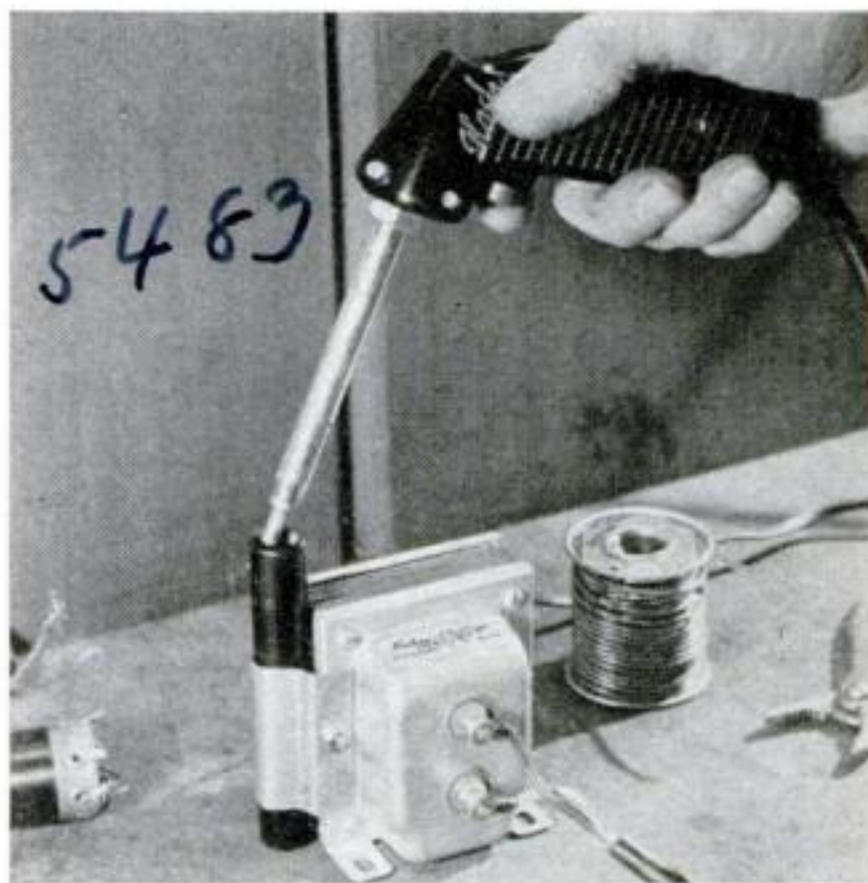
Depending upon the size and current drain of the motor (it must not exceed the safe capacity of the primary winding) either a high- or low-voltage secondary may be employed. If the transformer has both, as shown, the unused portion must be left open. —Alva A. Queen, Ft. Lauderdale, Fla.

2291



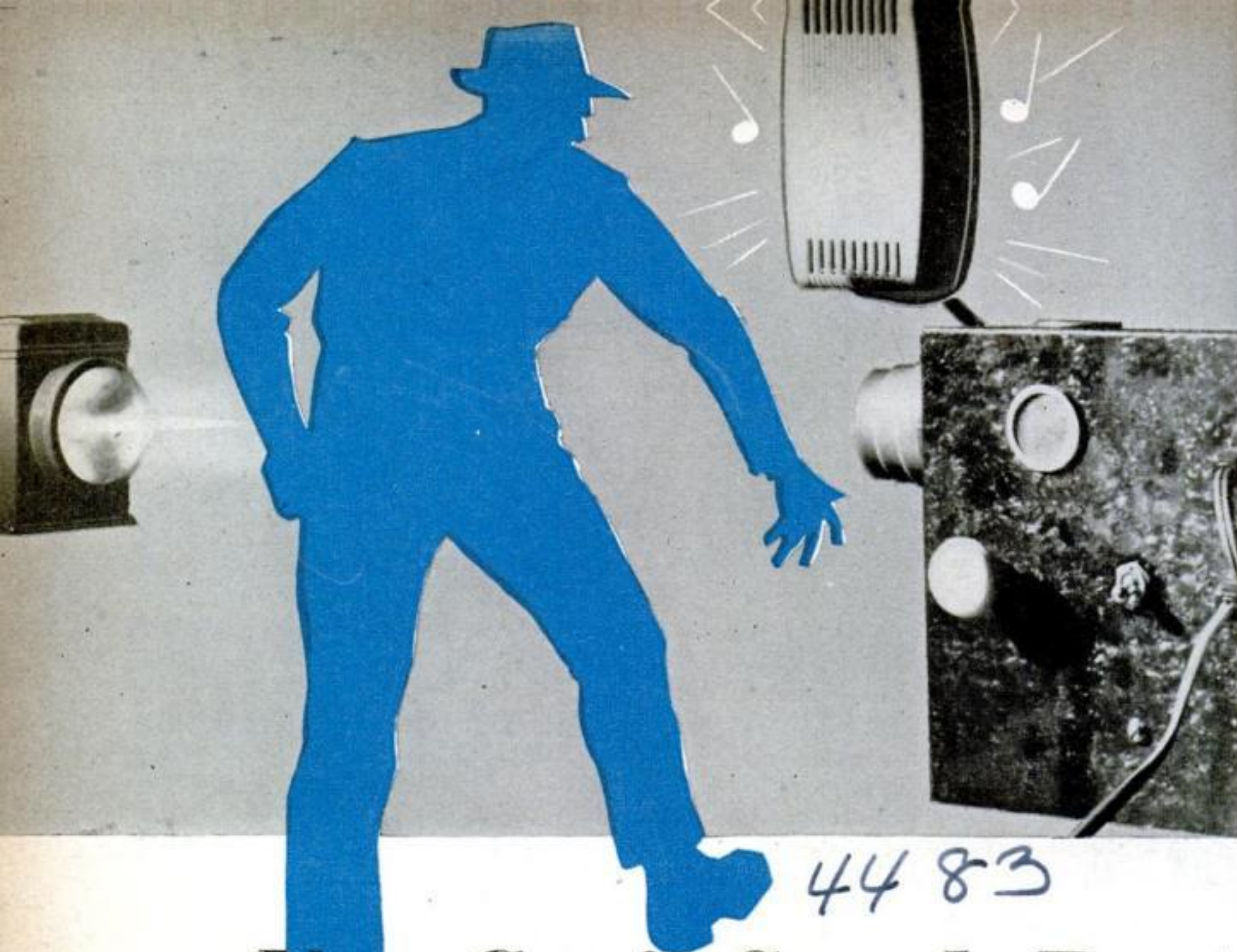
Commutator Seats Brushes

AFTER undercutting a motor commutator, it is necessary to reseat the brushes. This is often done by pulling sandpaper around the commutator, but you'll save yourself some work by letting the burrs on the slots do the job. Insert the brushes and rotate the armature a dozen turns or so. The fine edges left on the bars will shave the brush faces to a perfect fit. With the armature still rotating, hold 00 sandpaper against the commutator to smooth it off. —Roy C. Bradley, San Bernardino, Calif.

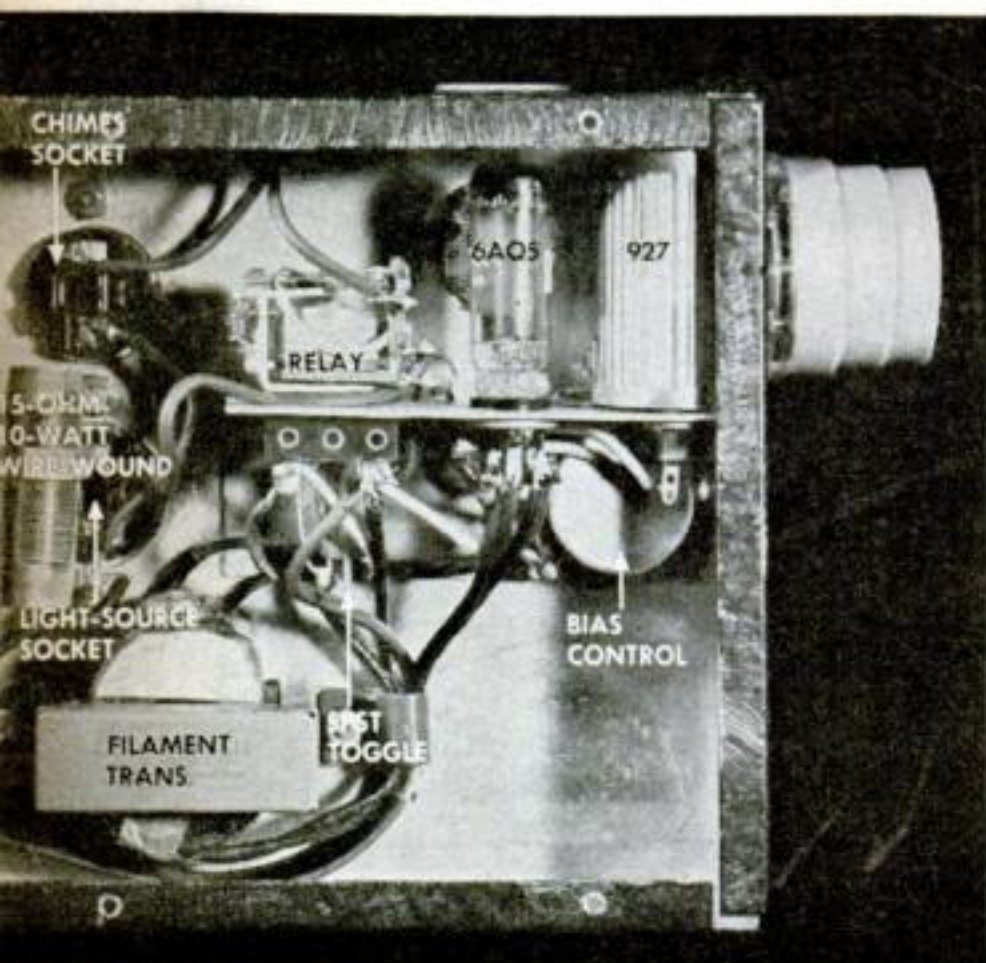


Tube Supports Soldering Iron

A HANDY holster for an electric soldering iron of the transformer-operated type is made by attaching a tube to the transformer. It should be slightly longer and about $\frac{1}{8}$ " more in diameter than the iron. The hard-rubber tube shown is secured by a strip of aluminum and a bolt. A metal tube would serve as well, but plastic that might soften under heat should be avoided. —Walter E. Burton, Akron, Ohio.



You Can't Sneak Past This Robot Watchman



ARE you allergic to sneak thieves? Would you like a little advance warning when visitors cross your lawn? Want your car's headlights to open garage doors? Maybe you need an electric eye to help you keep watch. There's no end to the chores that a suitably rigged phototube will perform. The setting sun, for example, can be made to turn on the lights in the chicken house, and sunrise will turn them off. A photoelectric unit has few rivals for fire alarms, motor shutoffs, emergency control units, switches that illumine the front door or driveway at the approach of a caller or a car . . . the list can be extended to the limit of your imagination.

In the setup shown here, the 6-volt output of the photocell-and-relay box is used to sound a door chime when any person or object breaks the beam. By improvising a few parts—such as the light source—it should be possible to keep the cost low. In this case a flat flashlight was converted into an electric

For a cabinet, a 2" by 7" radio chassis is used. The 6-volt transformer and sockets for chimes and light source are fastened to it; other parts are on a separate subchassis.

unit. A 3.8-volt bulb is powered by the same 6-volt filament transformer that is used for the heaters of the 6AQ5 amplifier pentode. Any flashlight with a strong light spot can be similarly used. One with a diffused beam is not suitable.

A piece of aluminum bent to a right angle $1\frac{1}{2}$ " high and measuring $1\frac{1}{4}$ " by $4\frac{1}{2}$ " on top is used as a chassis. The relay, 6AQ5, and 927 phototube are mounted on top of it. Make sure that the 3-prong socket for the 927 is oriented so that light strikes the sensitive face of the tube. A shield (snipped to size from an ordinary tube shield) is recommended. Punch a hole through the shield and the front edge of the cabinet in a direct line with the face of the phototube.

Even though a focused beam is used, the light must be refocused directly ahead of the photoelectric tube. Two dime-store magnifying glasses proved adequate for this purpose. They are set into a plastic flashlight head which is reversed and cemented over the light passage in the cabinet. An alternative method of mounting the lenses is illustrated in the lower right-hand drawing below.

Some ventilation is needed for the 6AQ5. To provide it, three 1" holes were punched in the cabinet around it and the holes were covered with screen plugs.

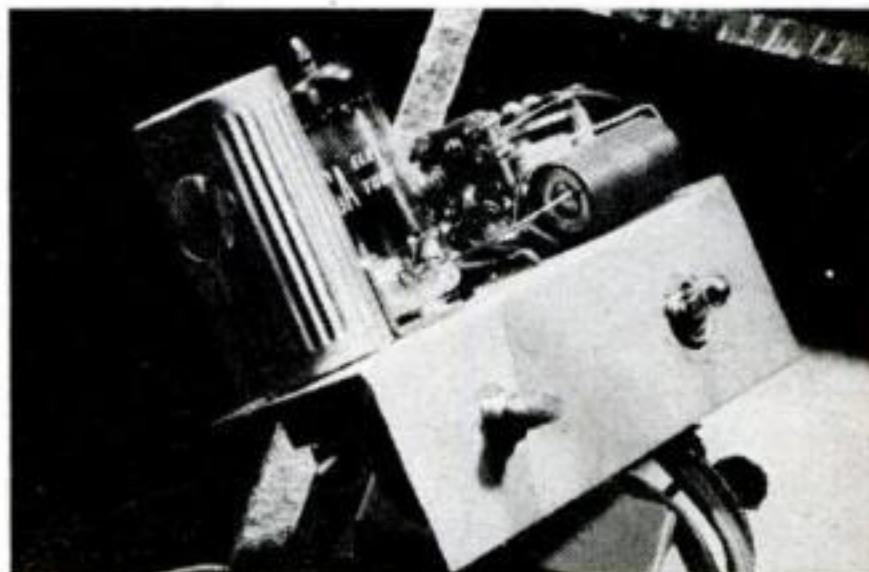
Actual resistance of this relay is 3,800 ohms; one measuring from 3,000 to 4,000 should be satisfactory. Contacts must be at least single pole, double throw for most photocell applications.

When the assembly is complete, plug the chimes and flashlight into the connectors provided for them (recessed sockets set into the side of the cabinet), turn on the switch, and watch the operation of the relay. As the amplifier tube warms up, the relay should pull in; if not, adjust the bias control until it does. Focus the light and the concentrating lenses. When the spot strikes correctly, the relay should release or pull up. Breaking the beam will then cause the relay to pull back in and complete the 6-volt circuit that energizes the chimes.

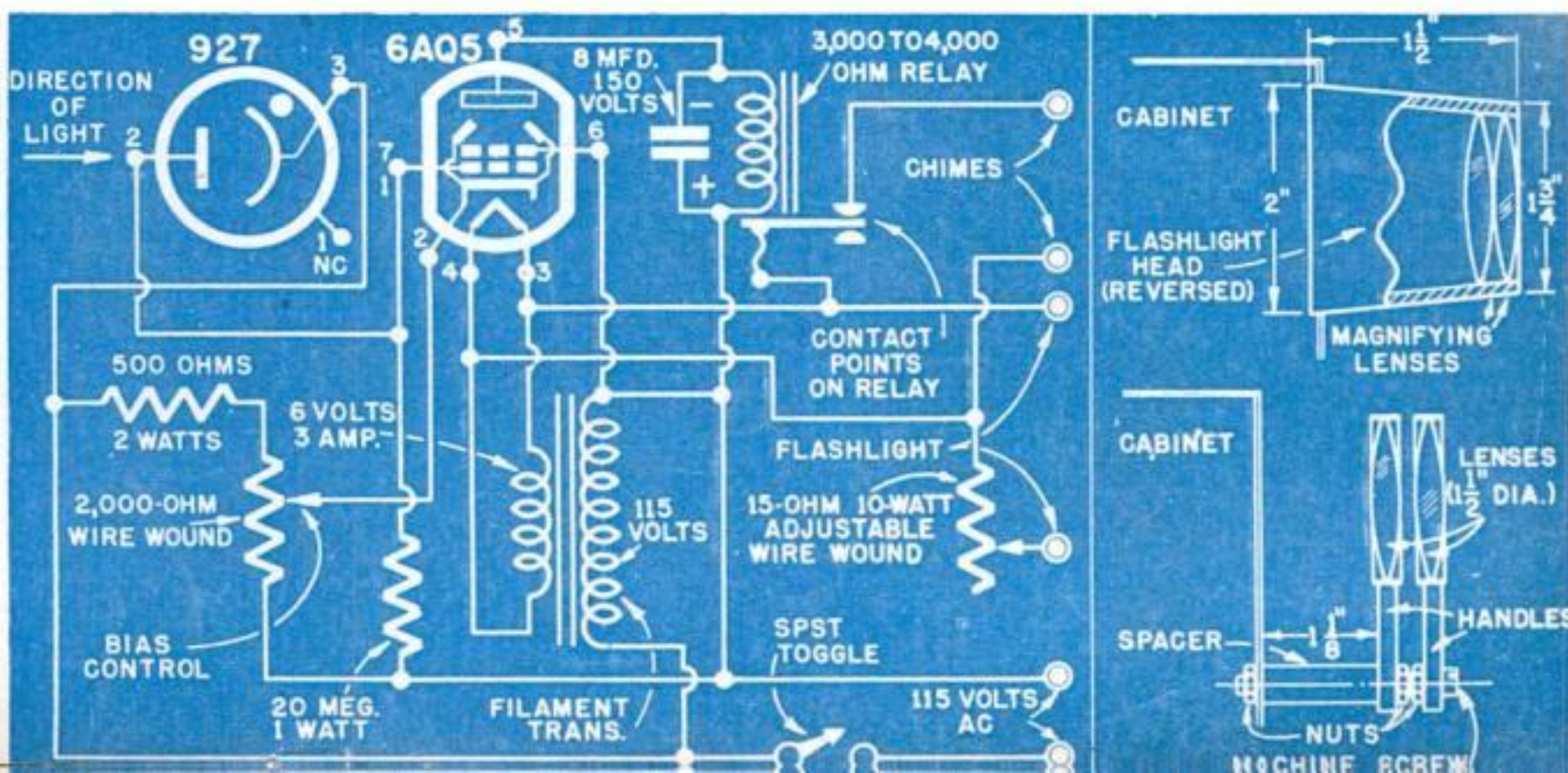
With this light source, maximum operating distance of the unit is about 8'—ample for most applications. Should greater range be required, substitute a stronger light.—*Frank Tobin, Manhattan, N. Y.*



Wires soldered to the contacts electrify this flashlight. Power is taken from the filament transformer. A 15-ohm adjustable resistor drops the voltage from 6 to about 4.5.



Inside the shield is the phototube with the 6AQ5 and relay lined up behind it. The small chassis is held in the cabinet by the shaft nuts of the switch and bias potentiometer.



Armchair Tuner Reaches to Your Radio

Sit back and relax . . . this two-tube remote control puts the pick of the programs at your fingertips.

By Edward Blanton

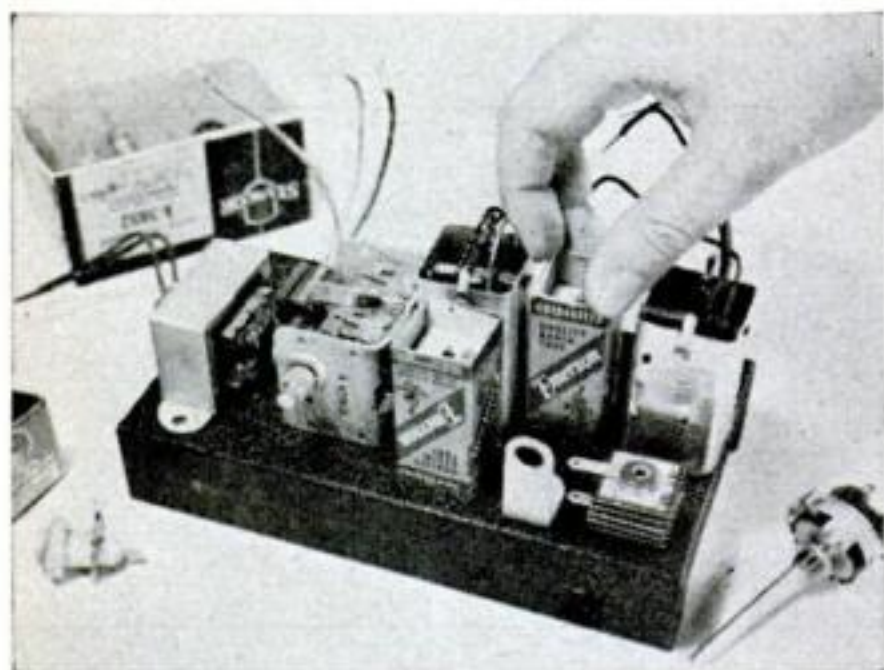


HOW do you measure the distance from your favorite armchair to the control knobs on a radio? You can count inches, centimeters, or the seconds it takes you to get across the room, but they won't tell you much. The real test is the effort you have to spend when you're settled down comfortably. That's when you are apt to find it too much trouble to pull yourself up in order to adjust volume or select a new program.

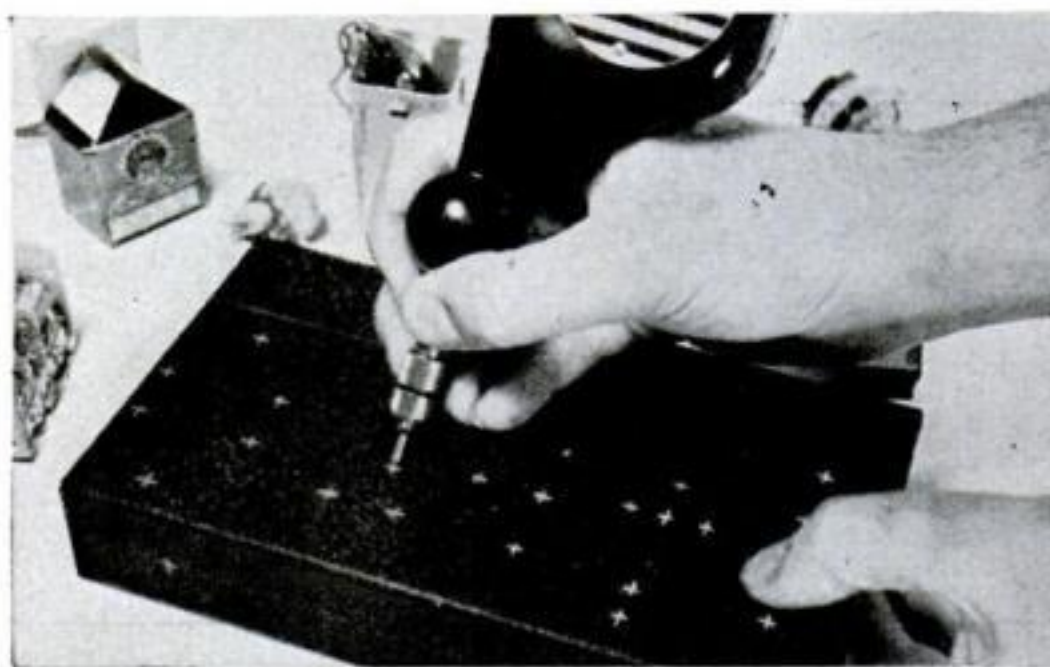
If you'd like to combine the tone and quality of your console with the portability of a midget that you can always keep at your elbow, here's a perfect answer. It's a little box that can be carried anywhere

around the room. You can place it on an end table or on the arm of a chair and let it reach out to mastermind your radio dial. One of its two knobs serves to tune in any station in the broadcast band; the other adjusts volume and turns the remote tuner on and off.

The unit might be described as a little less than half a radio—a two-tube superhet that stops short at the intermediate-frequency stage. Instead of being set to the usual 456 kc., the IF transformers are moved up to around 550 kc. The tuner then converts any incoming radio signal to this frequency and broadcasts it across the room. Like a relay runner, the regular radio takes



An experimental layout will help you determine the best arrangement of parts. It's a good way to achieve compactness without crowding.



Punch and drill all holes before assembly. An electric vibrating tool easily marks a crackle finish, and lets you identify tube sockets.

over at this point. When its dial is set to the same frequency as the tuner's IF's (say 550 kc.) it will pick up whatever program is being radiated by the little box.

Being half a radio, the tuner has half as many components as a comparable small set. Two 7-pin miniature tubes plus a dry-disk selenium rectifier do the electronic work. The tubes are a 6BE6 oscillator and first detector, and a 6BA6 IF amplifier.

For portability and general convenience it is desirable to keep the tuner reasonably compact. In assembling the tuner shown, the topside parts were arranged on a $1\frac{1}{2}$ " by $4\frac{1}{2}$ " by 8" chassis, occupying a width of $3\frac{1}{4}$ ". After all holes were drilled and punched, the extra $1\frac{1}{4}$ " of chassis width was hacksawed off.

Once the major parts are mounted you are ready to start wiring. The AC line cord is brought in under the chassis and held down with a cable clamp. The two wires from this cord are soldered to a two-lug terminal strip. One side of the power line is grounded to the chassis through SPST switch S1. (Caution: This makes the chassis "hot"; don't let it come in contact with an external ground and don't touch it when the power is on.)

One side of each of the transformer windings is also grounded. The ungrounded side of the secondary—6.3-volt—winding goes to pin 3 on both tube sockets. Both pins 4 are then soldered to a chassis terminal to complete the heater connections.

The negative side of the selenium rectifier is wired to the ungrounded side of the 115-volt primary winding of T1. Polarity is important here. The positive side of the rectifier goes to the filter circuit through R6.

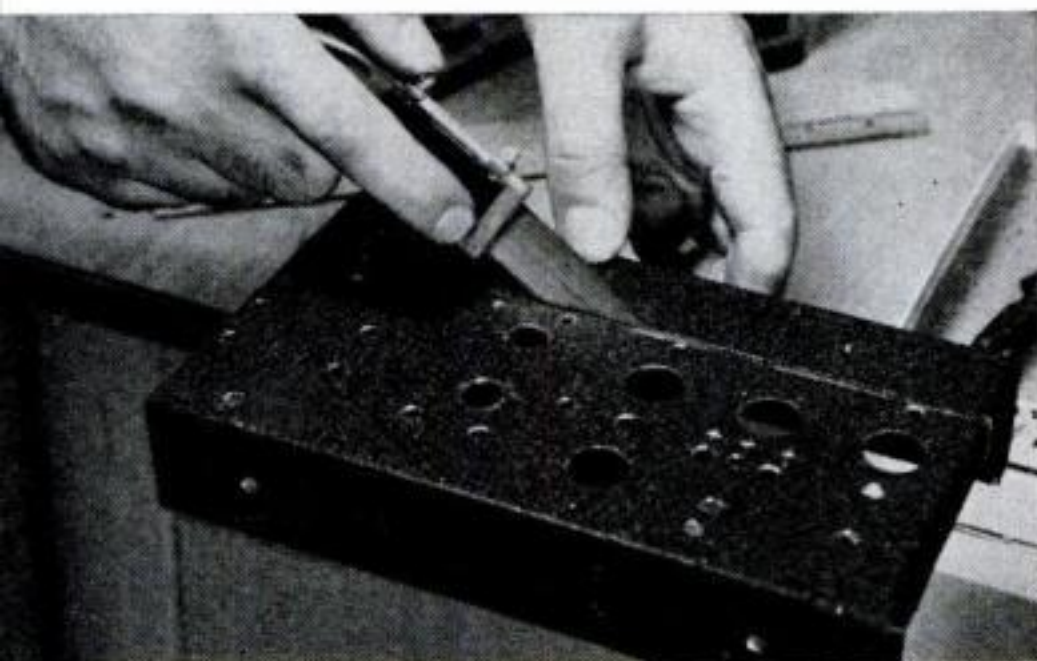
Most manufacturers mark this side with a red dot or a plus sign.

If you'll recall what was said earlier about resetting the IF transformers, you will see why it is necessary to take special pains in the selection and use of these transformers. Most commercial units are limited in range to from 400 to 500 kc., and these are no good at all here. What's needed is a pair of *wide-range* IF's that are tunable to about 600 kc. The bottom limit will probably be about 380 kc., but this is less important. Be sure to mention these frequencies when ordering the transformers, and also add the specification "iron core."

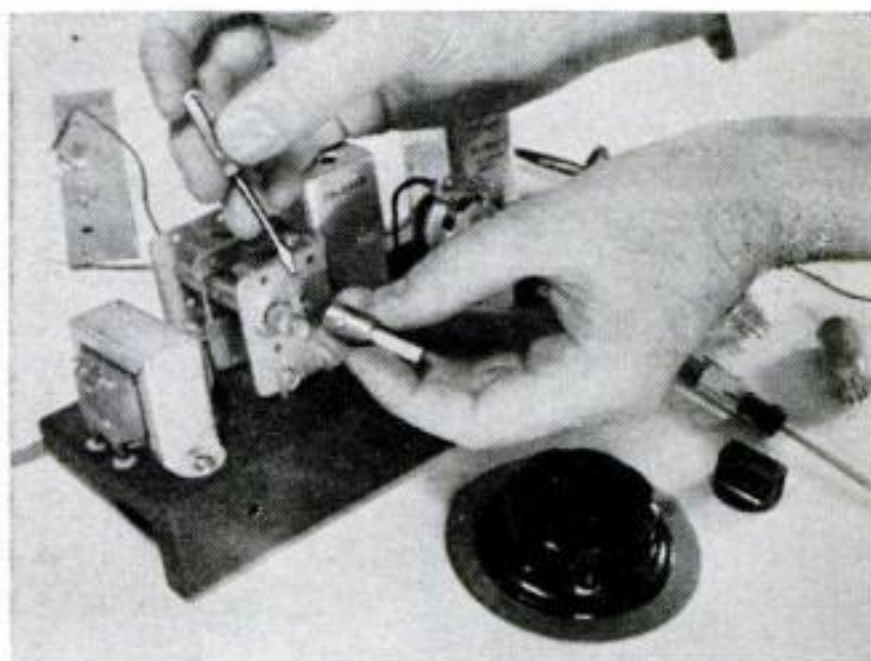
An old file cabinet measuring $4\frac{1}{2}$ " by $6\frac{3}{8}$ " by $8\frac{3}{8}$ " serves to house the tuner. The hinged side becomes the front and an opening is cut in the back to allow free ventilation for the tubes. This hole is concealed by the loop antenna, which is mounted on the back of the box with $\frac{1}{2}$ " brass spacers and 1" machine screws. A cover or protective backing for the loop may be made from any thin, nonmetallic sheet.

The opening in the back of the cabinet is also used to bring out the line cord and a 25' hank of wire that serves as the transmitting antenna (the loop is the receiving aerial). Fasten these leads with a cable clamp to keep them from pushing out on the loop. The transmitter antenna is tossed out on the floor when the tuner is in use.

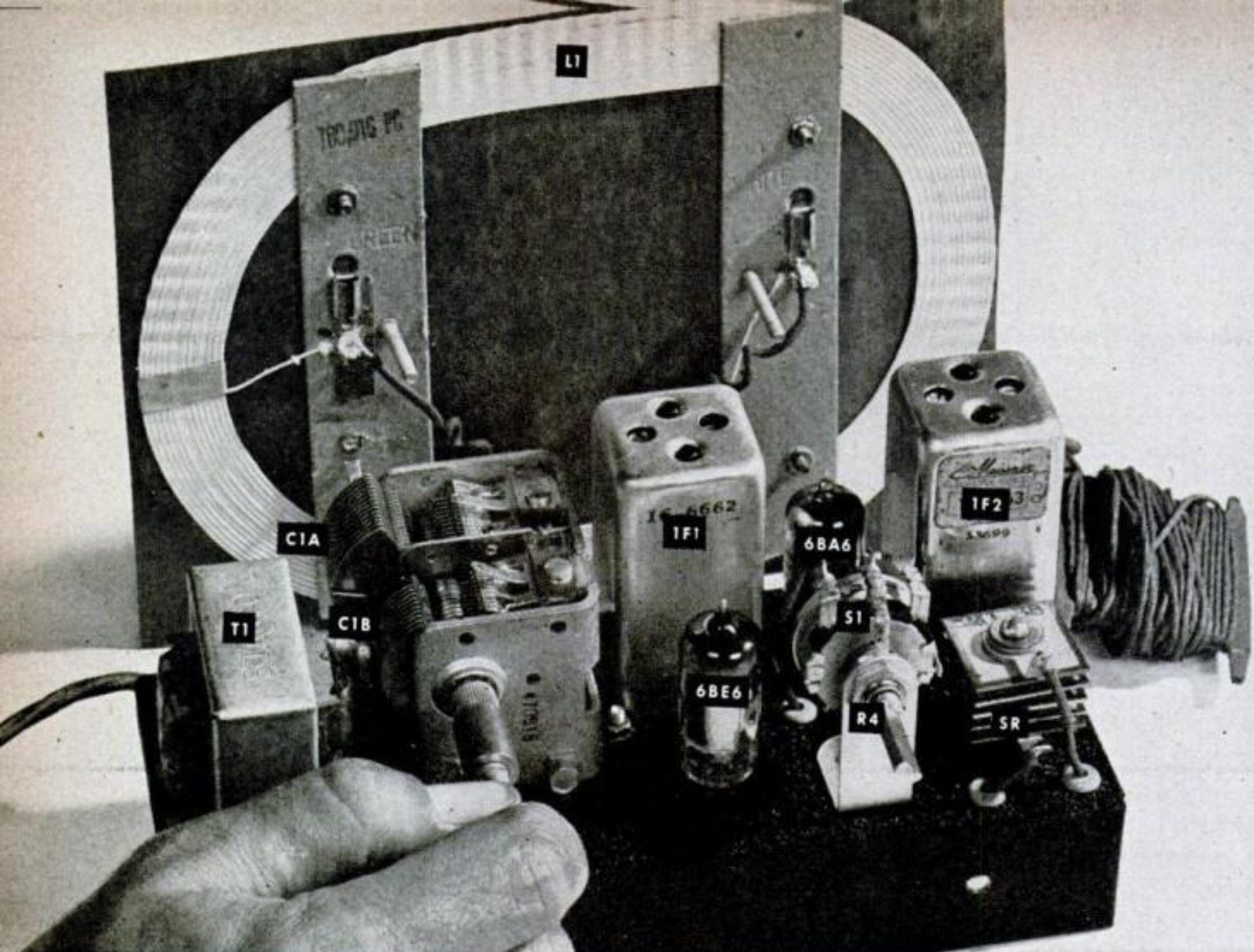
Adjusting the tuner is not difficult but it takes a little patience. First turn on your radio and set the dial to a quiet spot around 550 kc. Put the tuner antenna (the transmitter hank) close to that of the receiver but without making direct contact. Now start raising the frequency of the IF



To save space, a strip $1\frac{1}{4}$ " wide was hacksawed from the standard $1\frac{1}{2}$ " by $4\frac{1}{2}$ " by 8" chassis. This was done after layout, drilling, and punching.



The stubby shaft on the two-gang tuning condenser used in this set didn't clear the panel, so a shaft extension was attached as shown.



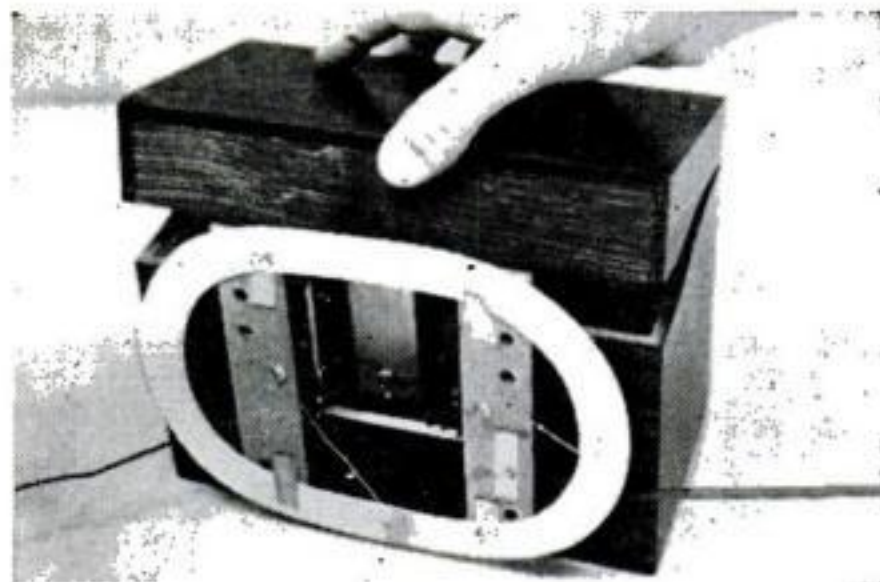
Try to follow this arrangement of the major components for short leads and easy wiring.

transformers from their preset value of about 456 kc. to about 550 kc. Do this by decreasing the capacity of the trimmers—turning them counterclockwise—a little at a time. Adjust all four trimmers more or less simultaneously by taking a half turn on each one and then going on to the next. While you are doing this, keep rocking the dial of the remote tuner so that the plates of the variable condenser are moving from about half mesh to fully open (the upper half of the broadcast band). Continue the adjustments until the tuner begins to pull in stations on the radio. The first sign of success may be a squeal or a whistle.

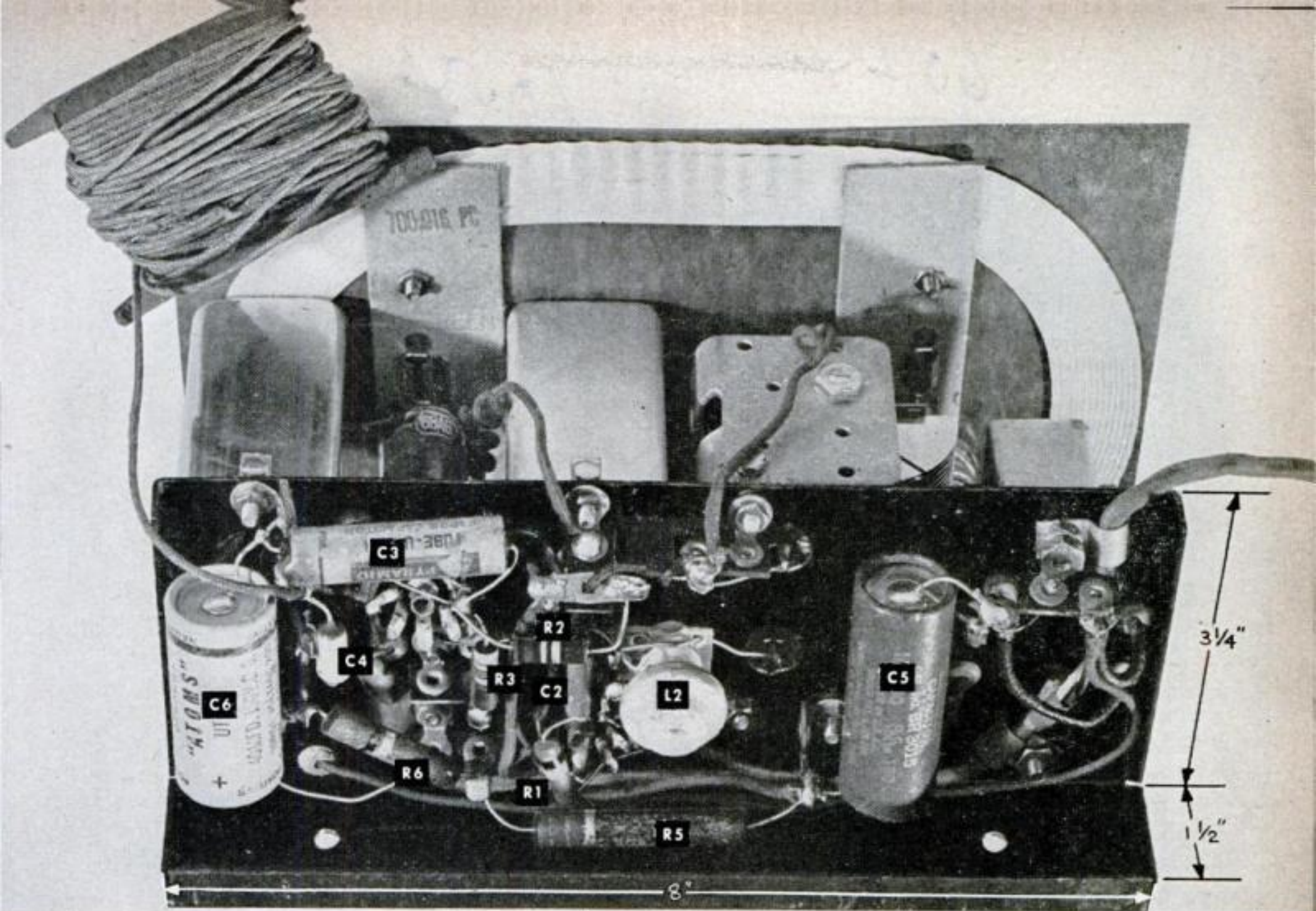
Once you've reached this point, make careful adjustments on the trimmers until stations come in with maximum volume. Align the trimmers on the tuning condenser (chiefly on the oscillator section) until a station around the middle of the broadcast band (850-900 kc.) comes in near the middle of the remote-tuner dial. Now make a final check to be sure that the highest local station can still be brought in.

You'll probably find that the tuner compresses the broadcast band from 10 to 30 percent—that is it will cover the entire

band while traveling only 70 to 90 percent of its full sweep. The reason for this is that the oscillator is still working at a lower frequency than the IF's. You will therefore have to log stations a little bit differently on the tuner dial, but their relative positions should remain about the same. If you should happen to be using an adjustable oscillator coil—which was not done in the unit shown—you may be able to raise the coil frequency by changing the position of the iron core. This should somewhat reduce the compression of the tuning range. **END**



Here the tuner has been mounted in the filing box. Note the large ventilating hole at rear.



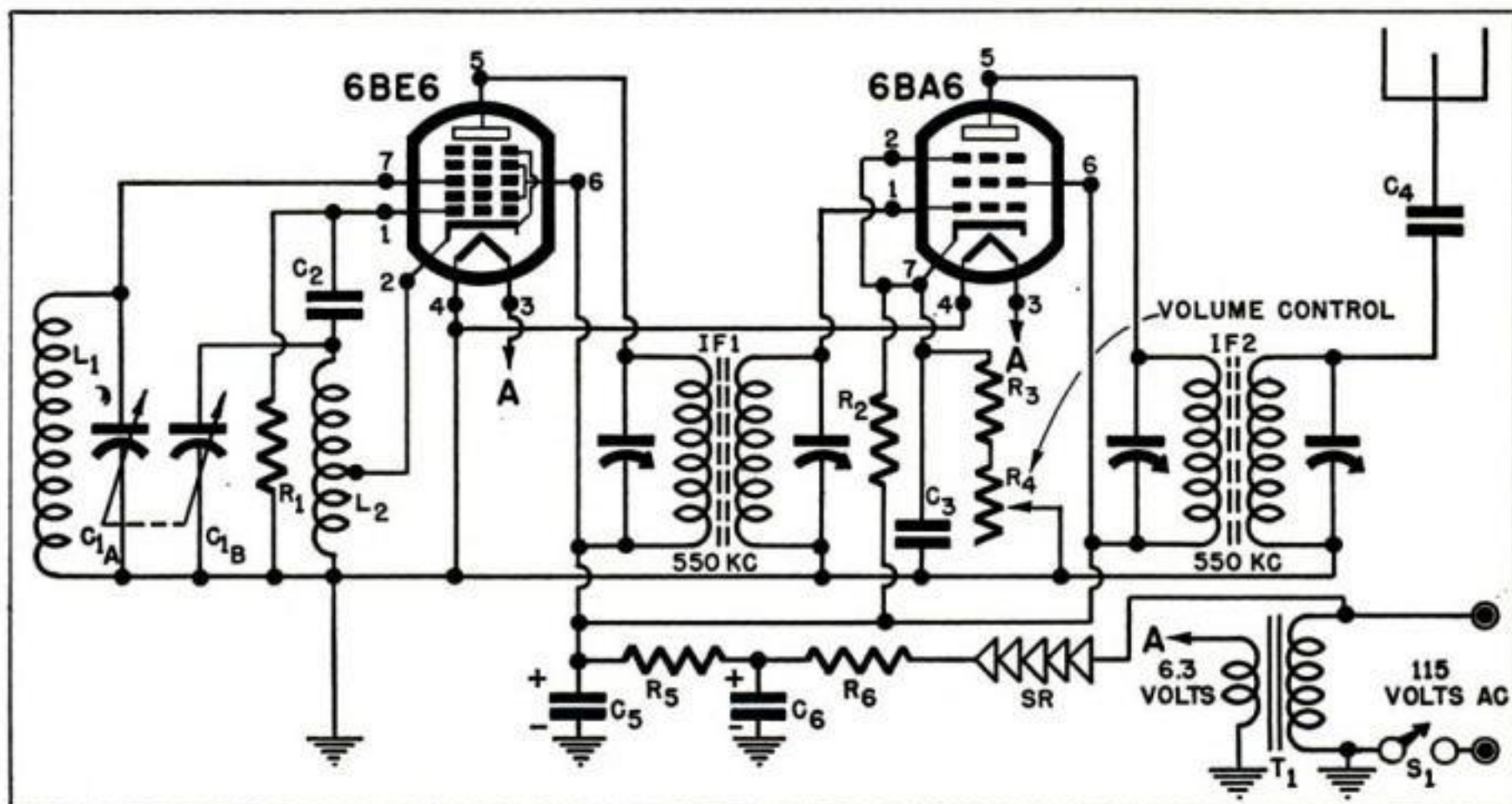
Bottom view of the completed chassis. It's "hot," so see that it isn't externally grounded.

LIST OF PARTS

R1: 10,000-ohm, $\frac{1}{2}$ -watt carbon.
 R2: 22,000-ohm, $\frac{1}{2}$ -watt carbon.
 R3: 330-ohm, $\frac{1}{2}$ -watt carbon.
 R4: 15,000-ohm potentiometer with switch (S1).
 R5: 2,200-ohm, 2-watt carbon.
 R6: 51-ohm, 1-watt carbon.
 C1, A, B: 2-gang, variable condenser with cut-plate osc. section.

C2: .0005-mfd. mica.
 C3: .05-mfd., 400-volt paper.
 C4: 50-mmfd. ceramic.
 C5: 30-mfd., 150-volt dry electrolytic.
 C6: 40-mfd., 150-volt dry electrolytic.
 S1: SPST rotary switch on R4.
 T1: Filament trans. with 6.3-volt secondary.

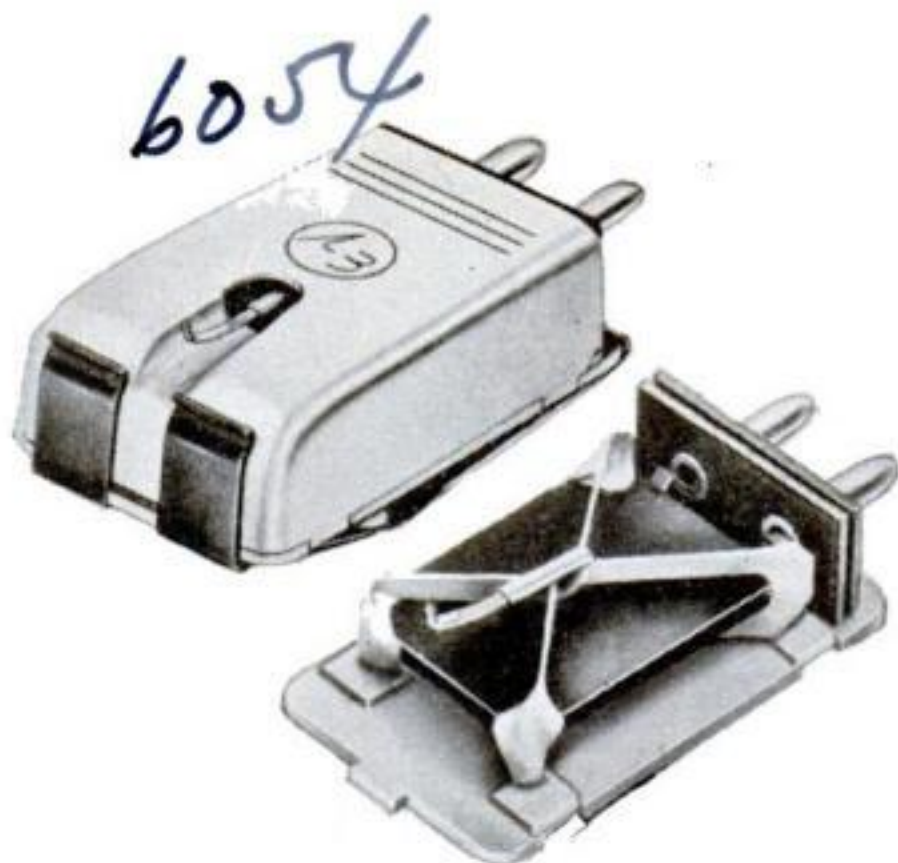
L1: Loop antenna.
 L2: Tapped oscillator coil.
 IF1, IF2: Input and output wide-range (380-600 kc.) iron-core IF transformers.
 SR: 100-ma. selenium rectifier.
 Miniature tubes and sockets, 25' hank of antenna wire, tuning dial, chassis, cabinet, misc. hardware.



6024



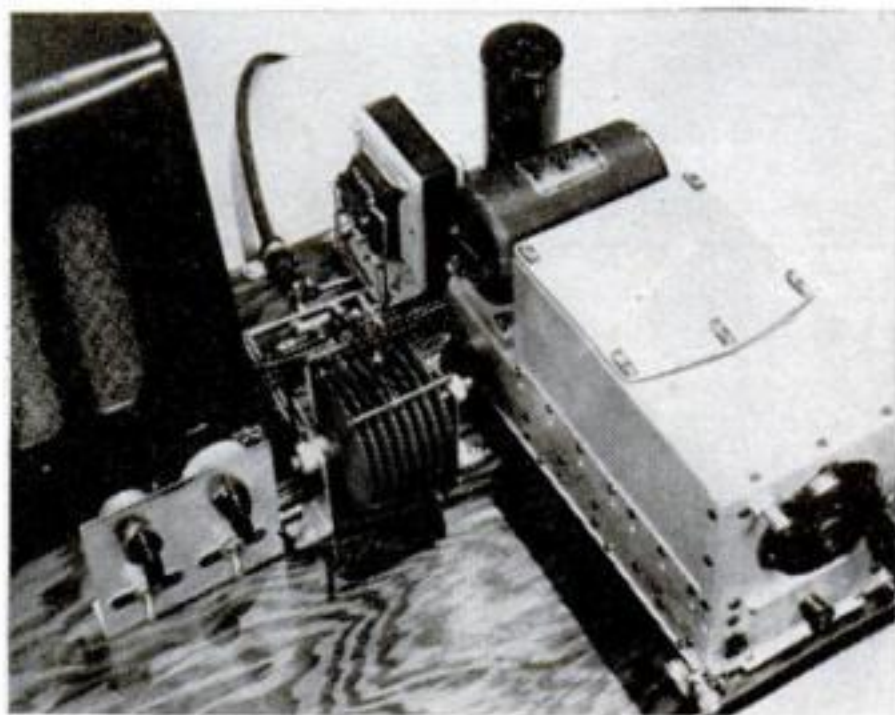
TV Set Works on AC-DC. A television receiver that will operate on 115-volt DC as well as AC of any frequency from 25 to 60 cycles has been announced by Raytheon-Belmont, Chicago. The set employs a 200-kc. RF power supply to provide deflection voltages up to 4,200 volts on DC and 5,500 on AC. A floating chassis is said to diminish line noises. This table model has a 7" direct-view screen, uses 17 tubes and one rectifier, and retails for about \$180 plus installation charges.



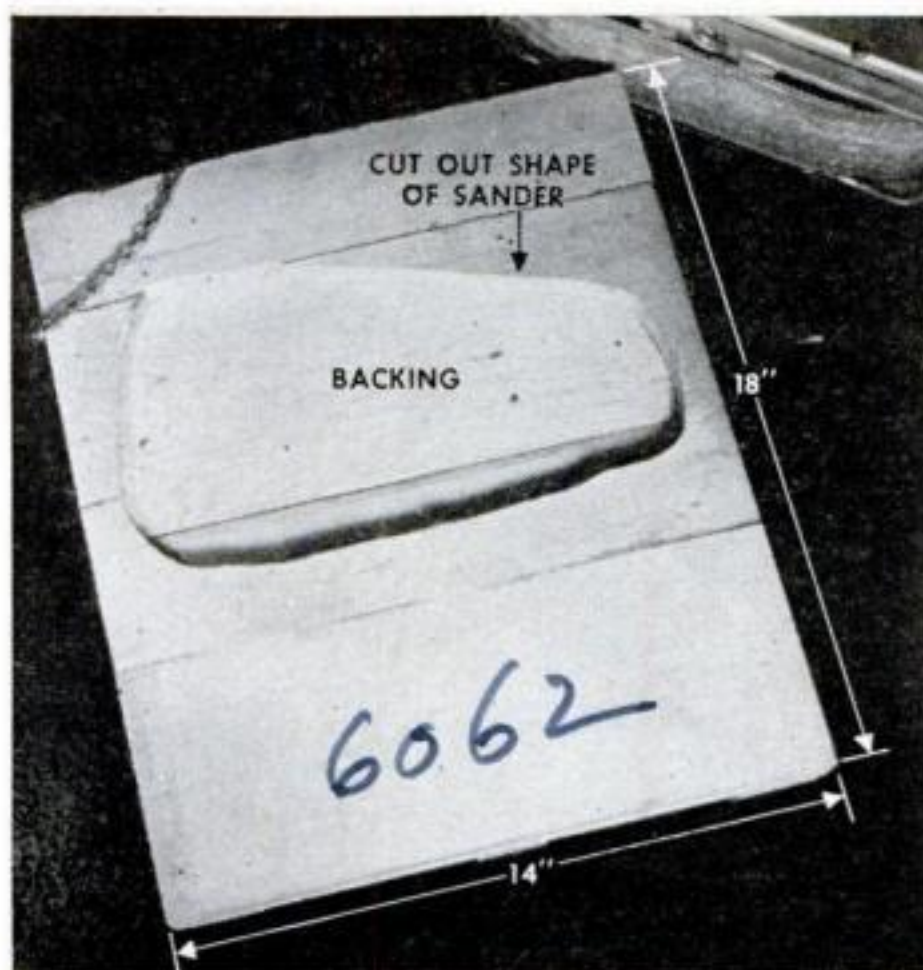
Stylus Torque Drives Crystal. Suspended from a four-sided harness, a phono needle transmits lateral or rotary movement directly to the corners of a piezoelectric crystal that converts the movement into varying voltages. The needle has high compliance to both lateral and vertical movement, but the latter—a common source of record scratch—cancels itself out and produces no voltage. Cartridge and mounting plate weigh 1/5 oz. Electro-Voice, Inc., Buchanan, Mich., makes the Torque Drive® cartridge in three basic types said to be suitable for replacement of over 100 standard crystals.



Phone Turns Off Radio. A base plate for telephones, marketed by Kenworth Mfg. Co., Milwaukee, will turn off a radio or other appliance when the receiver is lifted from its cradle. The phone rest contains a normally-off snap switch that is connected to a series plug through which the radio is attached.

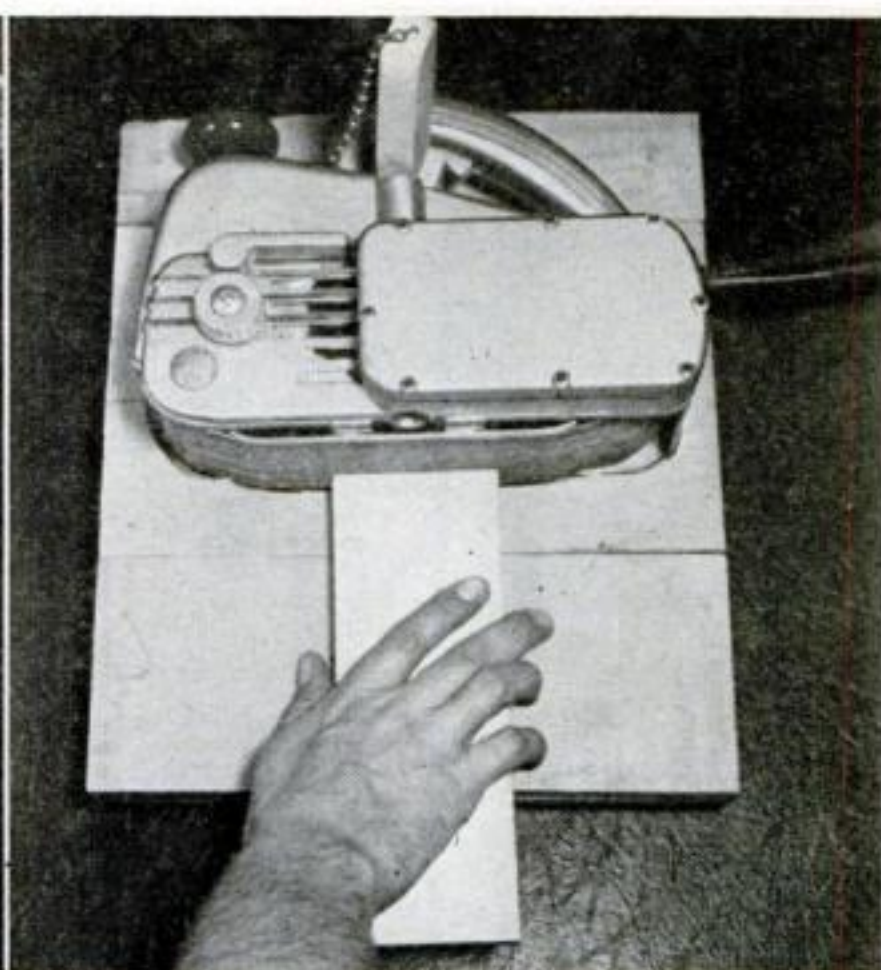


Converters for Ham Sets. Many war-surplus receivers have been tantalizing radio hams and experimenters by offering a lot of radio for very little money. The drawback has been that the sets must be altered for use on AC. Radio Products Sales, Inc., Los Angeles, now distributes conversion units as illustrated above. This one is being used to power an Army surplus BC-454 receiver.



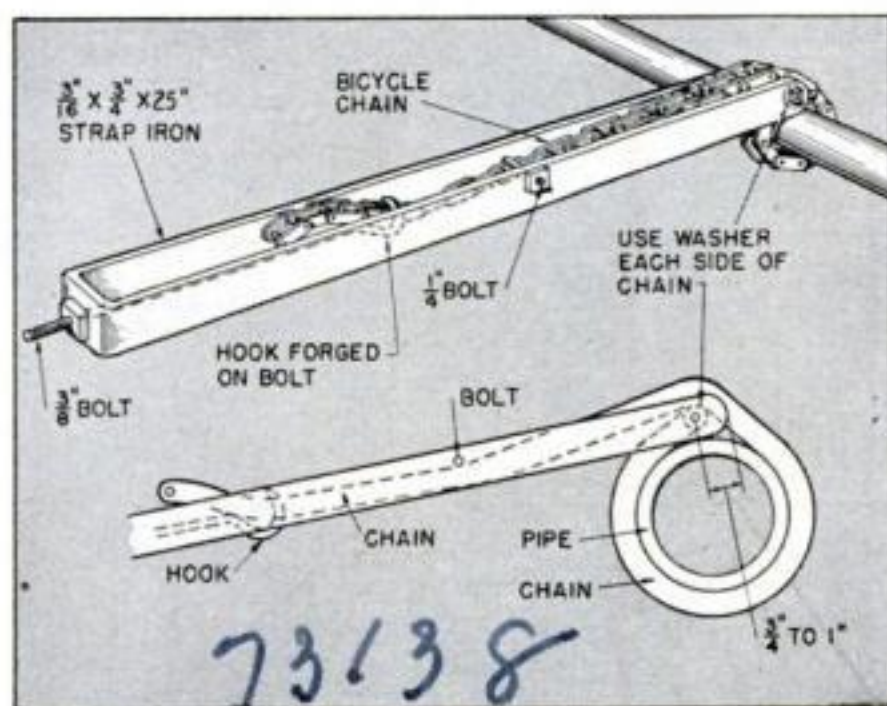
Jig Adapts Sander to Bench Use

WIDENING the usefulness of a portable belt sander, this simple jig enables you to machine-sand edges flat and square with a face. It consists of two pieces of $\frac{3}{4}$ " lumber, one cut out to form a cradle for the sander, and the other a backing surface or base. If solid stock is used, run the grain of one



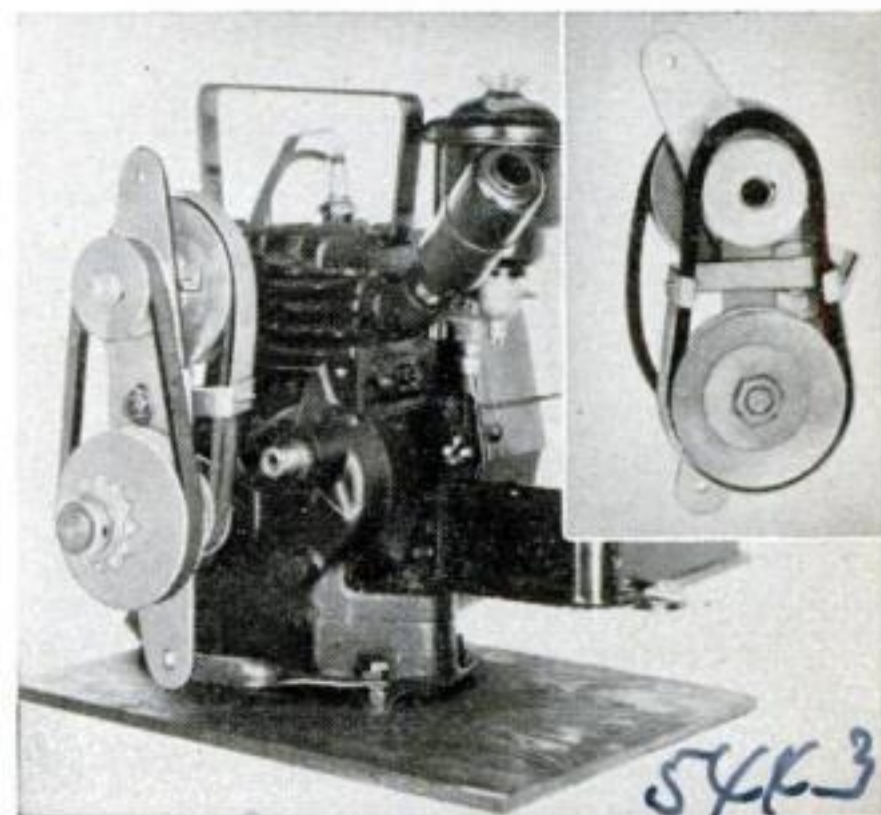
piece at right angles to that of the other. Cleats may be added as feet.

It's important, of course, to have the sanding belt at exactly 90 deg. to the jig surface. Tack blocks or wedges in the cutout as necessary to align the machine. On the one shown, a wedge is also used to hold the trigger switch in "on" position, as at right above.—Whitney K. Towers, Los Angeles.



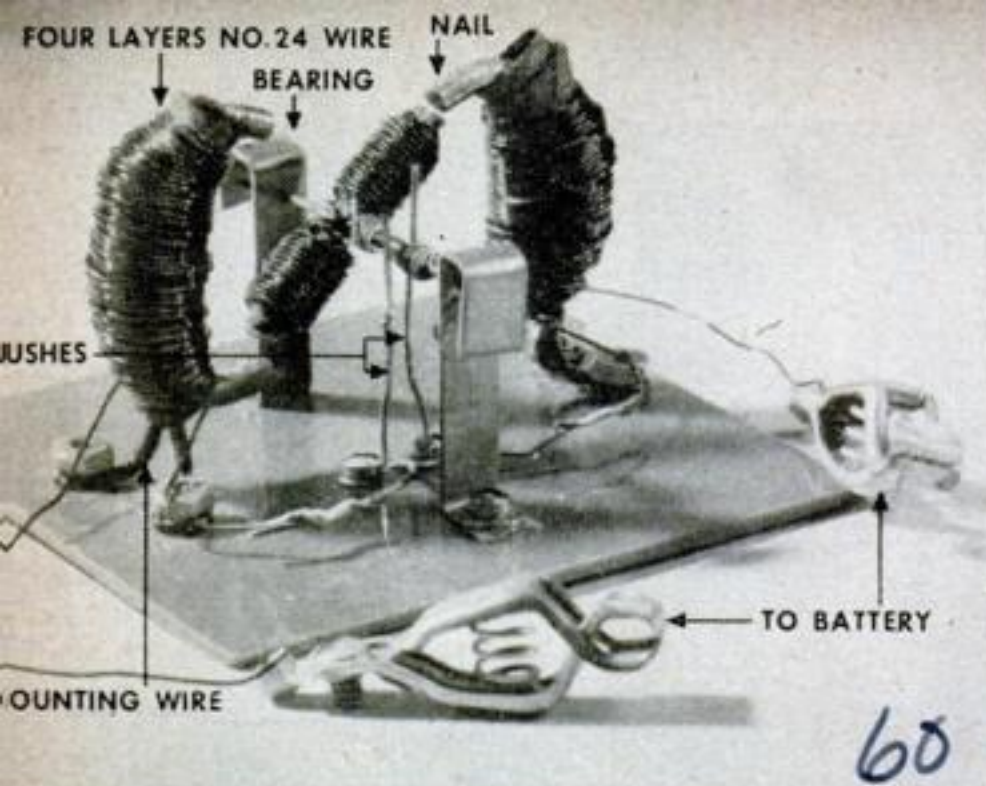
Pipe Wrench Grips by Chain

WORKING like a chain pipe vise, this home-made wrench grips a wide range of pipe sizes. Its 12" long frame is bent up from strap iron, with a clearance hole for a bolt in the short bend. A bicycle or motorcycle chain is bolted to the other end. The lever is laid against the pipe, the chain wrapped around the way you wish to apply force, and a link hooked on. The bolt nut gives adjustment.—C. L. Meehan, Lakeview, Ontario.

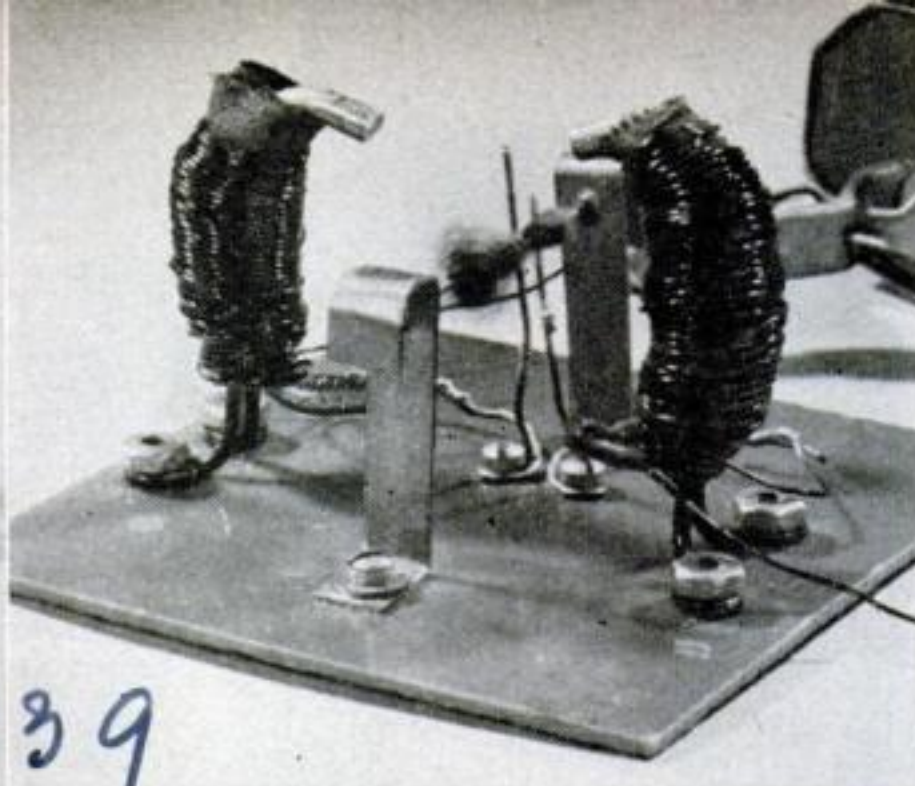


Reduction Unit Includes Clutch

GIVING 3-to-1 speed reduction and clutch control, this unit is designed to drive scooters, lawn mowers, and the like with small gas engines, or to provide slow speed on drill presses and other machines. Hinged at the center, it "breaks" to slack off both belts as in the small photo. Crain-McCurdy Company, Des Moines, Iowa, makes it.



Crate-nail special runs on 3 to 6 volts, AC or DC. Although it has four field poles, construction is simplified by having only two of them act on the armature. Bearings are strips



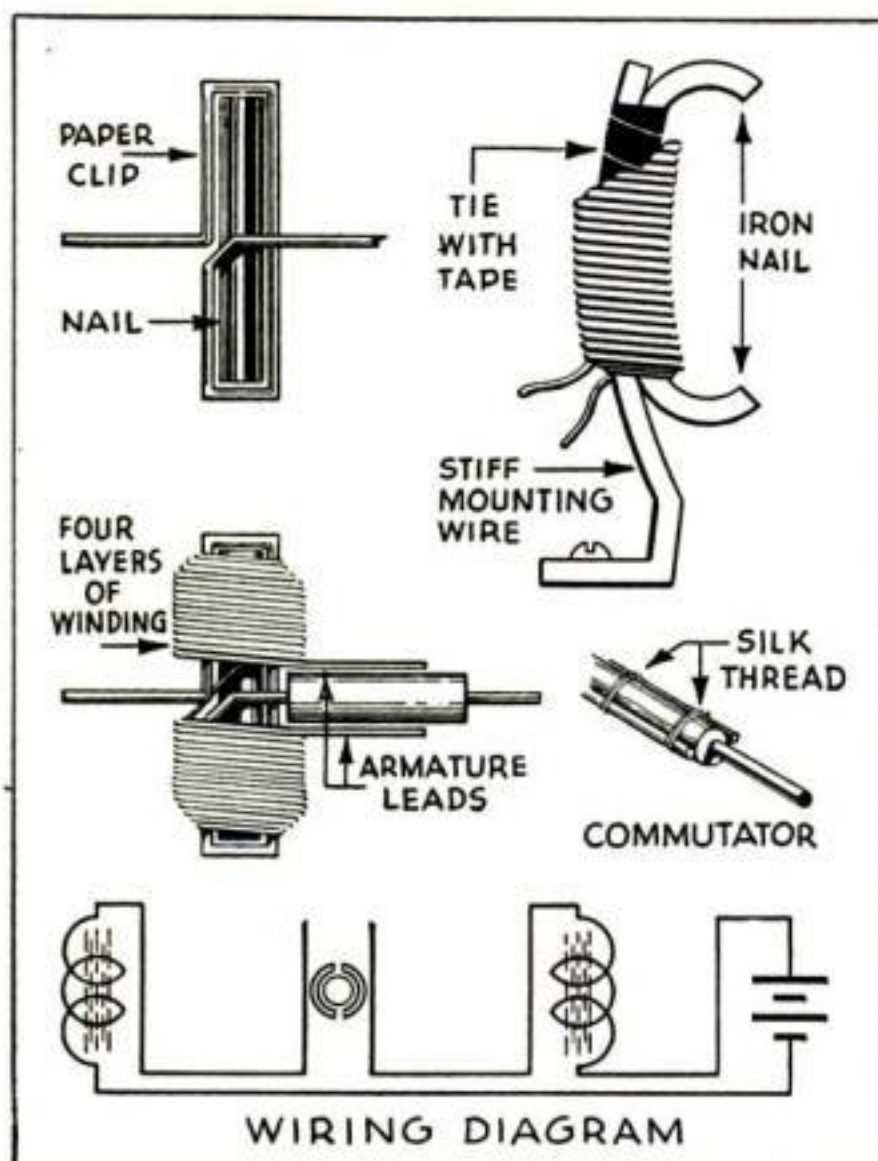
of tin plate bent over at top to retain shaft against end play. Because of dead area on the commutator, armature must be in a favorable position in order to start by itself.

Nails Form Magnets of Midget Motor

A HANDFUL of shop scrap, plus an hour or two, are the chief ingredients of this little homemade motor. Showing in capsule form how the big ones work, it'll buzz furiously on three or four dry cells.

Cut off $1\frac{1}{4}$ " from a husky nail, and around it bend a straightened paper clip as shown at right. Be sure the extending shaft parts are aligned. Bind with a layer of friction tape. Starting near the shaft, wind half the armature with four layers of No. 24 insulated copper wire. Continue with the same wire, crossing the shaft to wind the second half in the same direction, finishing at the shaft. Slip on a bit of radio spaghetti tubing, scrape the ends, and bind them on.

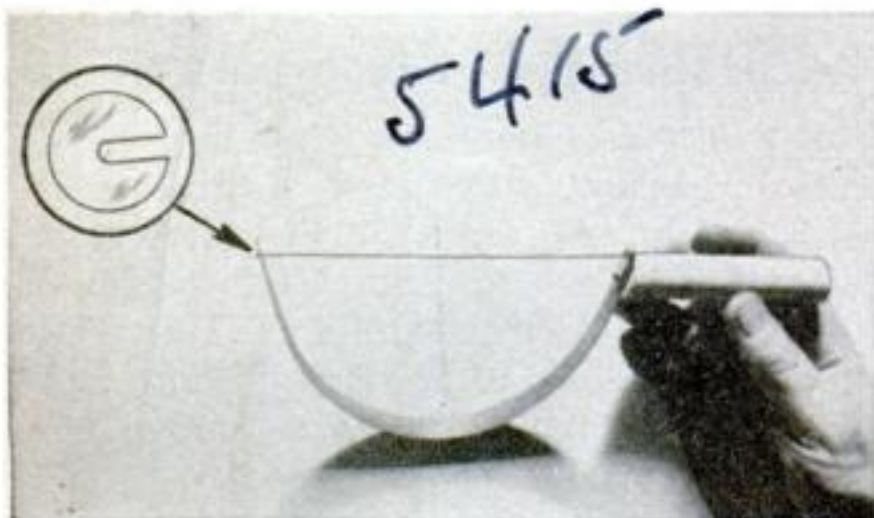
Shape field magnets from two thick nails, and bend heavy copper or brass wire into supports. Bind with tape; then wind on four layers of wire, starting and ending at the bottom. Mount so the armature clears the field poles by $\frac{1}{16}$ ". Attach two bare wires to bear on opposite sides of the commutator.—*Kenneth Rogers, Chicago.*

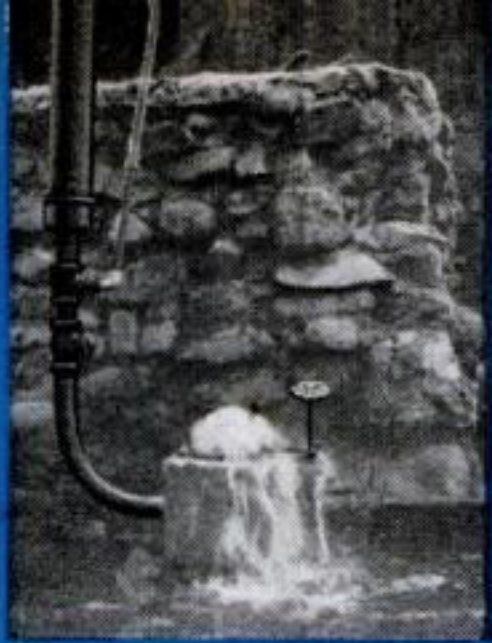


Friction tape joins armature coil and shaft, as well as field magnets and supports. Wood base will do instead of plastic one shown. If motor won't run, reverse leads to one field.

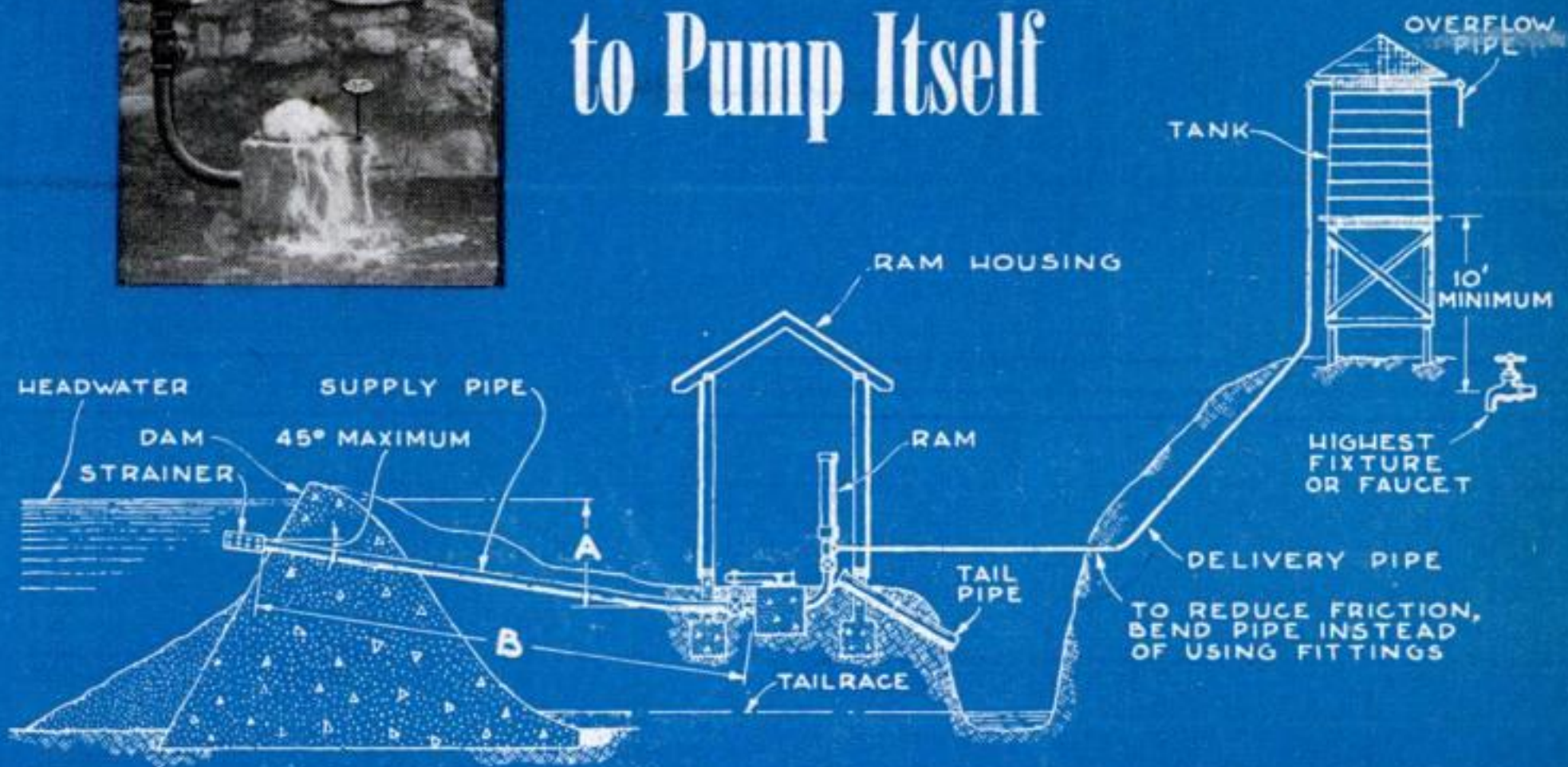
Improvising a Scroll Saw

You may need a coping or scroll saw in a hurry and have none at hand. Here's one you can make. Pass an ordinary pin-end blade through the holes in a hacksaw blade. Behind the pins, slip C-washers cut from sheet metal or made by slitting small common washers. The bent hacksaw blade provides tension. If you want a handle, punch an extra hole in it for a wood screw.





Hydraulic Ram Forces Water to Pump Itself



Here's a way you can have running water at minimum cost if there's a natural supply near your home.

WHERE conditions are suitable, a hydraulic ram is a very economical method of pumping water. The first cost is all you need to consider. Thereafter, a properly built ram will operate for years at no expense except for possible minor repairs.

A ram gives this economy by putting the water itself to work. Through a system of valves, it harnesses the energy imparted by falling water, forcing part of the flow to surge intermittently up a delivery pipe to an elevated storage tank.

If there's a spring, lake, pond, or stream in your vicinity to provide a constant flow, you have the first essential toward a steady supply of running water. Your source must be located so it can be piped to a lower level where the ram is located. There are two factors that determine how high the ram will raise the water. These are fall and slope, indicated above by A and B.

Fall is the vertical distance between the level of the headwater and the ram. Slope is the angle at which the water flows to the ram, but for convenience it's usually considered as the actual length of the drive pipe. For efficiency, the angle should not exceed 45 deg., and the length of the drive

pipe should be somewhere between five and ten times the fall.

Here are some typical installations:

Fall (A)	Slope (B)	Delivery above ram
5'	30'	20'
6'	30'	30'
8'	40'	40'
10'	50'	50'
12'	60'	60'
16'	80'	80'
20'	100'	100'
24'	125'	125'

A small but efficient ram may easily be built at home. For the base, use a 2" by 4" cast-iron reducing sanitary cross. Saw off the small 4" end 2" below the threads. Face or dress the bell end flat and true.

Make the spring, strap, and clamp from 3/16" by 1 1/4" galvanized flat-bar stock. For the escape valve, assemble a 1/2" by 3" nipple, 1/2" galvanized waste nuts with the ears cut off, a 4" valve rubber, and a backing disk. A 1/4" rod threaded at each end holds the assembly together.

The flange is made from a blind flange for 6" pipe. Drill a 2 3/8" hole in the center and drill and tap two holes for the 5/16" cap screws that retain the spring. Carefully dress one side of the flange to provide a smooth valve seat.

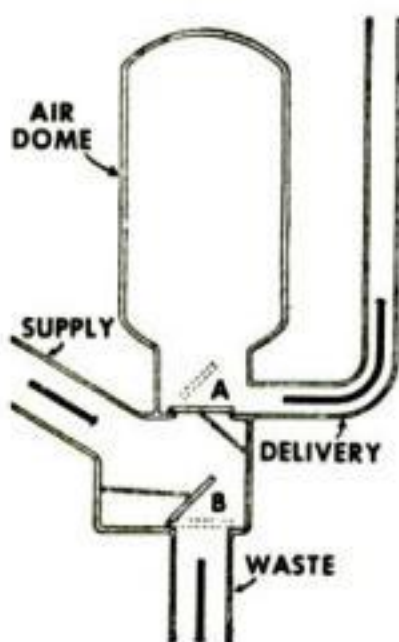
Assemble the cross with a 2" by 10" nip-

ple and a 2" conduit elbow. Tap the latter for $\frac{3}{8}$ " pipe about 2" below the threads at one end for the snifting valve.

Invert this assembly on the flange, with the bolts and clamp screws in place. Center the anchor bolts in the flange holes with tape and wire the washers in position. Stuff the interior of the cross with crumpled news-

paper, topping off the stuffing with a small piece of chicken wire. Also wrap several layers of wire fencing loosely around the cross to reinforce the cement. Then build a wood form to enclose the cross.

The cement block must supply a solidity and mass that absorbs the ramming shocks of the water. Hence it should be carefully



How Hydraulic Ram Acts

INVENTED a century and a half ago, the hydraulic ram harnesses the energy of moving water. As its name suggests, it rams, or pushes, part of the water to a higher level than the source.

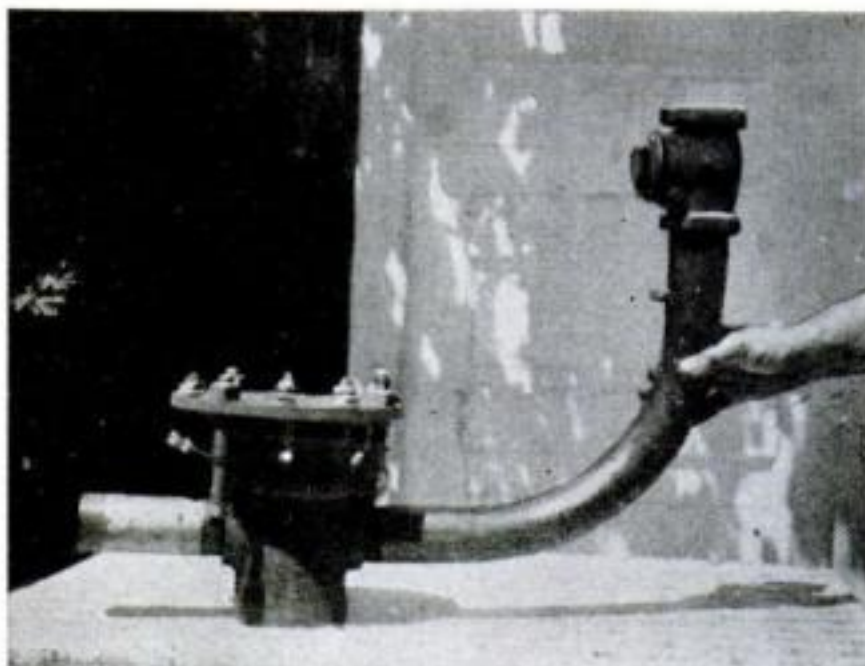
To start, water is admitted to the supply pipe. At this point, the delivery valve A is closed and escape valve B is open. As the flow of water gains velocity, it snaps valve B shut.

This abruptly arrests the moving column of water. The resulting shock or pressure impulse forces the delivery valve A open and drives water into the air dome and into the delivery pipe. Acting like a piston, the water compresses the trapped air in the chamber.

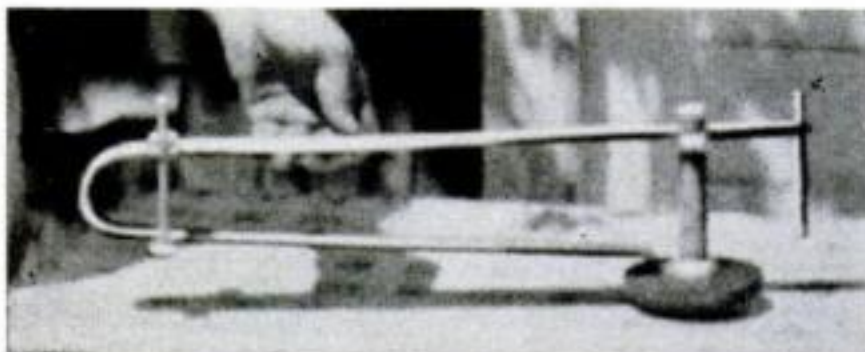
Finally, the compressed air kicks the water back, closing valve A and giving the water another boost up the pipe.

Meanwhile, the pressure wave traveling back up the supply pipe reduces pressure on escape valve B, allowing it to open. Again there's a rush of water down the supply pipe and the same sequence of actions occurs. Each time the water is rammed farther up the delivery pipe.

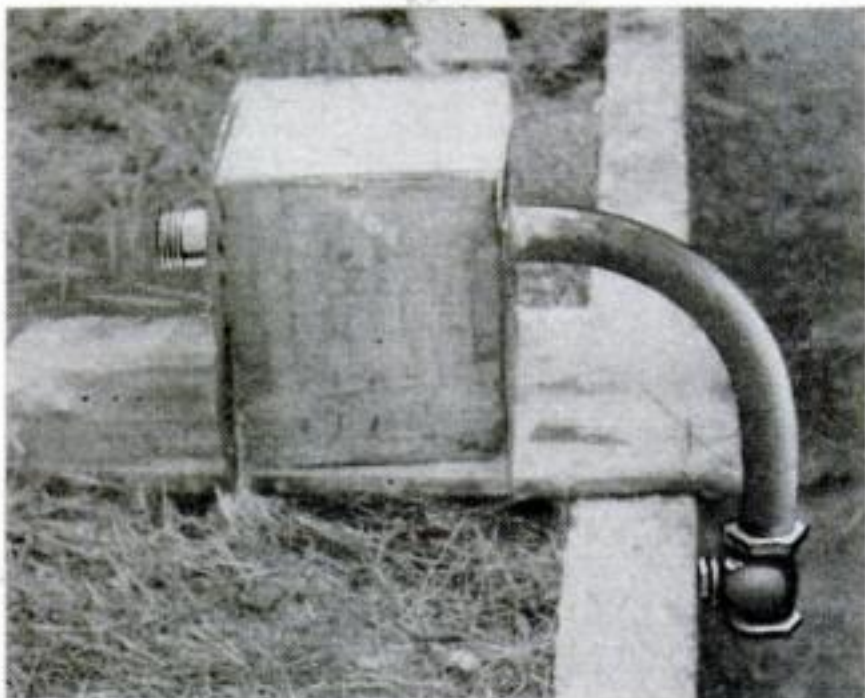
In the usual hydraulic ram, the cycle repeats 25 to 100 times a minute.



The ram is positioned like this for operation. Just above the hand notice the snifting valve, a device that automatically replenishes the air that's absorbed from the air dome.



Downward travel of the escape-valve spring is limited by bottom end of stop bolt at right. Adjust so valve opens about $\frac{3}{4}$ ". Moving the spring clamp varies the ram's operating rate.



Invert the assembly and build a form around it to give 6" or 8" of cement on all sides of the sanitary cross. Keep wet with moistened sacks for several weeks before removing the form.

made. Thoroughly mix equal parts of sharp coarse plaster sand and lump-free cement. Wet slowly until jellylike and tamp into the mold. When the cement has set, knock off the form, remove the flange and the newspaper stuffing, and fill the interior with cement up to the lower level of the inside of the 2" pipes. Smooth this to reduce friction.

The ram is now ready for installation. Lay a 2" supply pipe of a length equal to the height the water must be raised, keeping it straight and uniformly slanted. The fall should be as great as possible.

Cement the ram in position, connect the supply pipe, fit a gasket to the top of the cross, and bolt on the flange. Then assemble the escape valve and spring. Finally, attach the check valve and the capped 4" by 24"

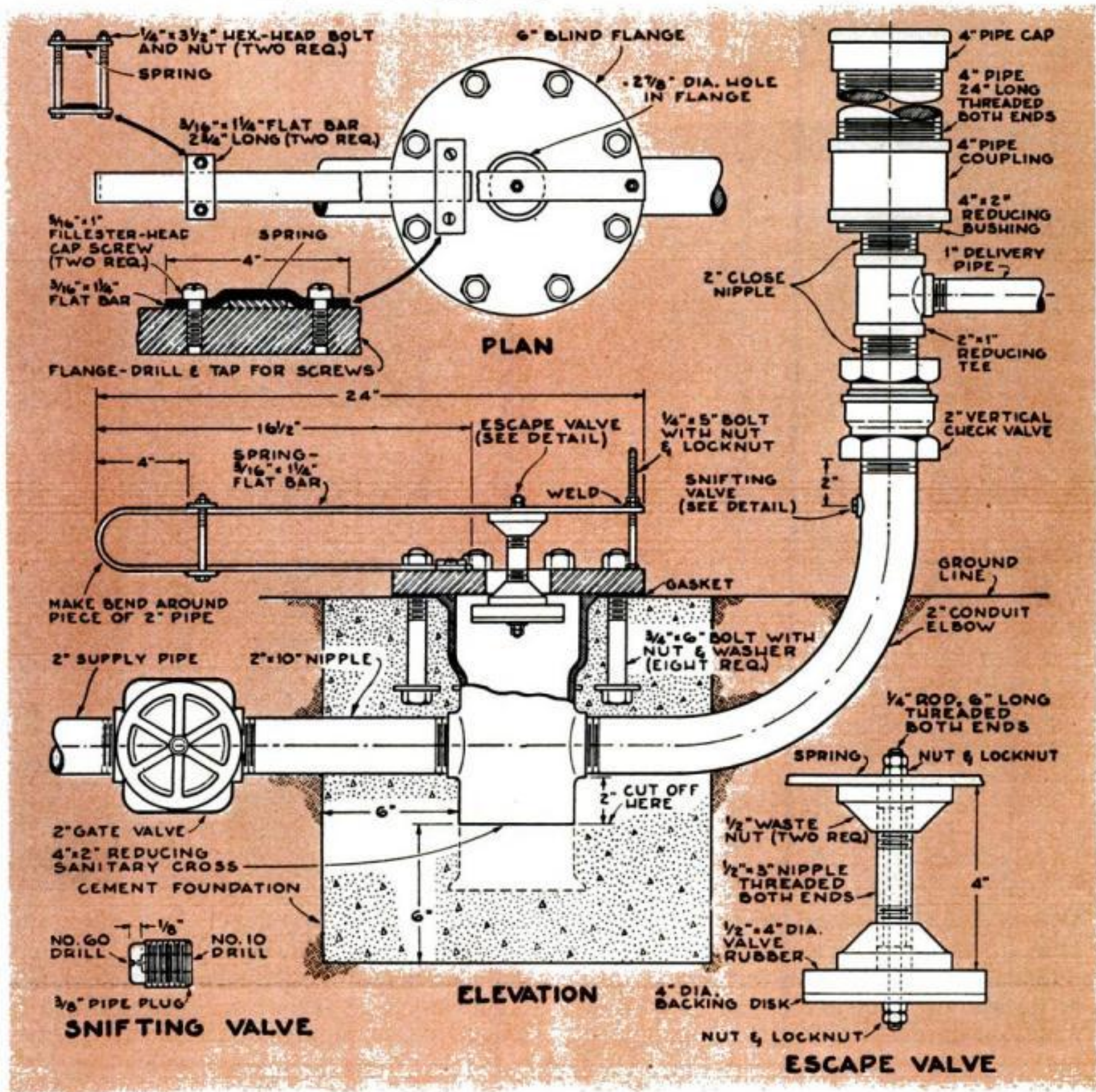
pipe nipple that functions as an air dome.

To start operation, open the gate valve, permitting the water to close the escape valve. Then push the escape valve open and allow the water pressure to close it. Repeat this action several times and the ram should pick up the cycle and operate automatically thereafter.

If you house the ram and use a tail pipe to carry away the waste water that flows out of the ram, be careful to locate the tail pipe high enough so it won't be submerged in times of flood. The overflow pipe from the supply tank may lead to a garden area, a stock tank, a pond, or back to the tailrace. The ram and piping must be buried below frost line or otherwise protected from freezing.—A. W. Kaufman, San Francisco.

2658 17th Ave

Parts available at most plumbing-supply shops are used in assembling this hydraulic ram.



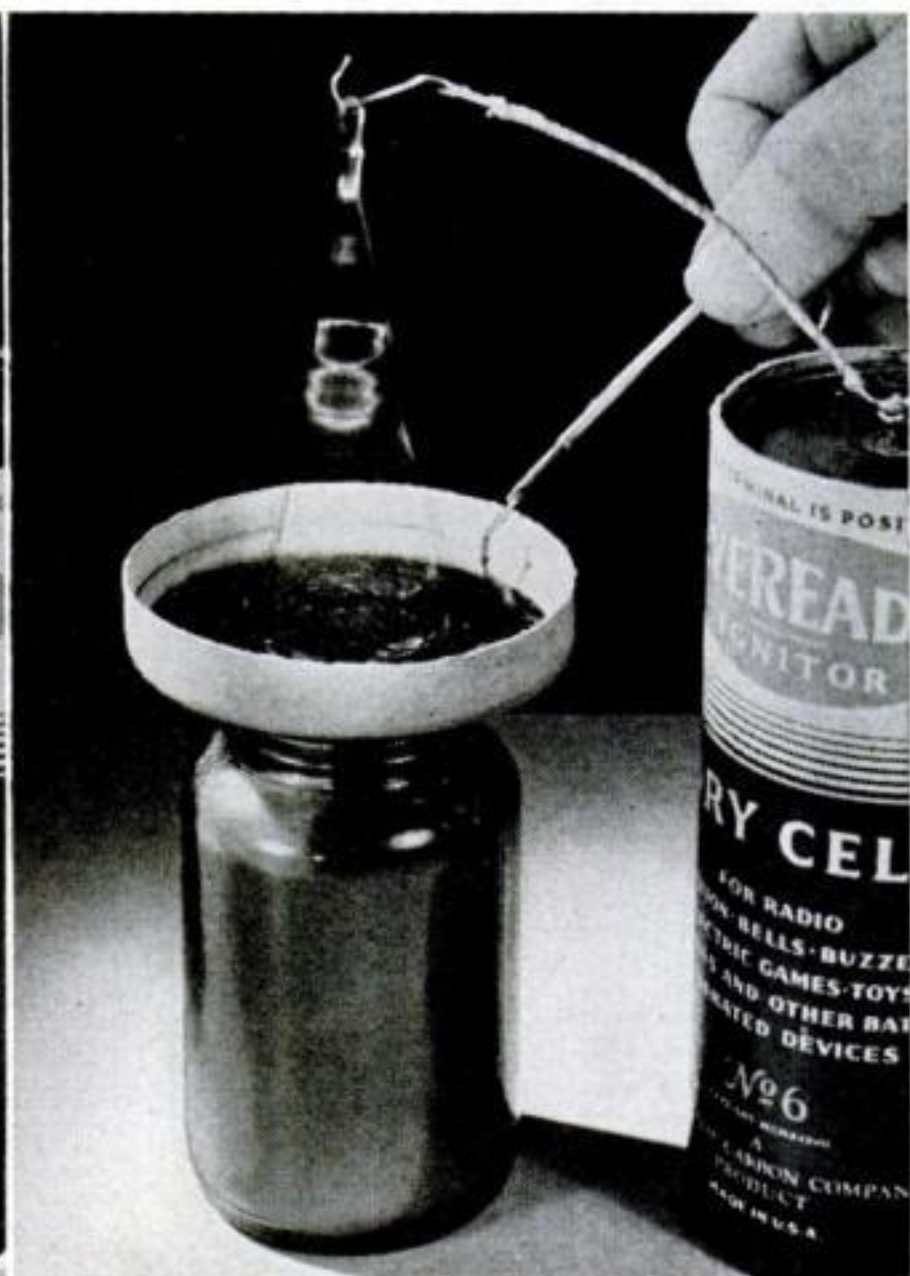
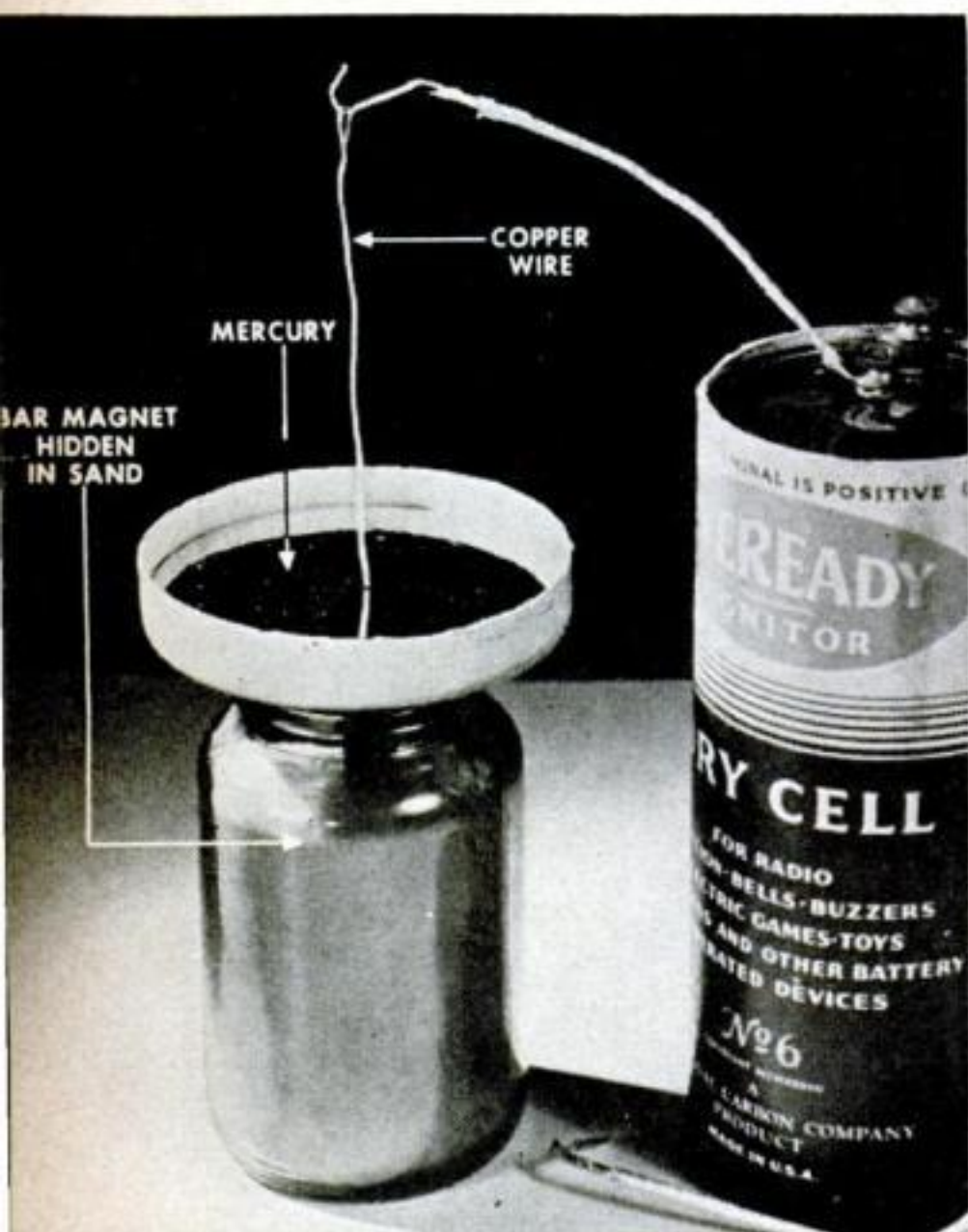
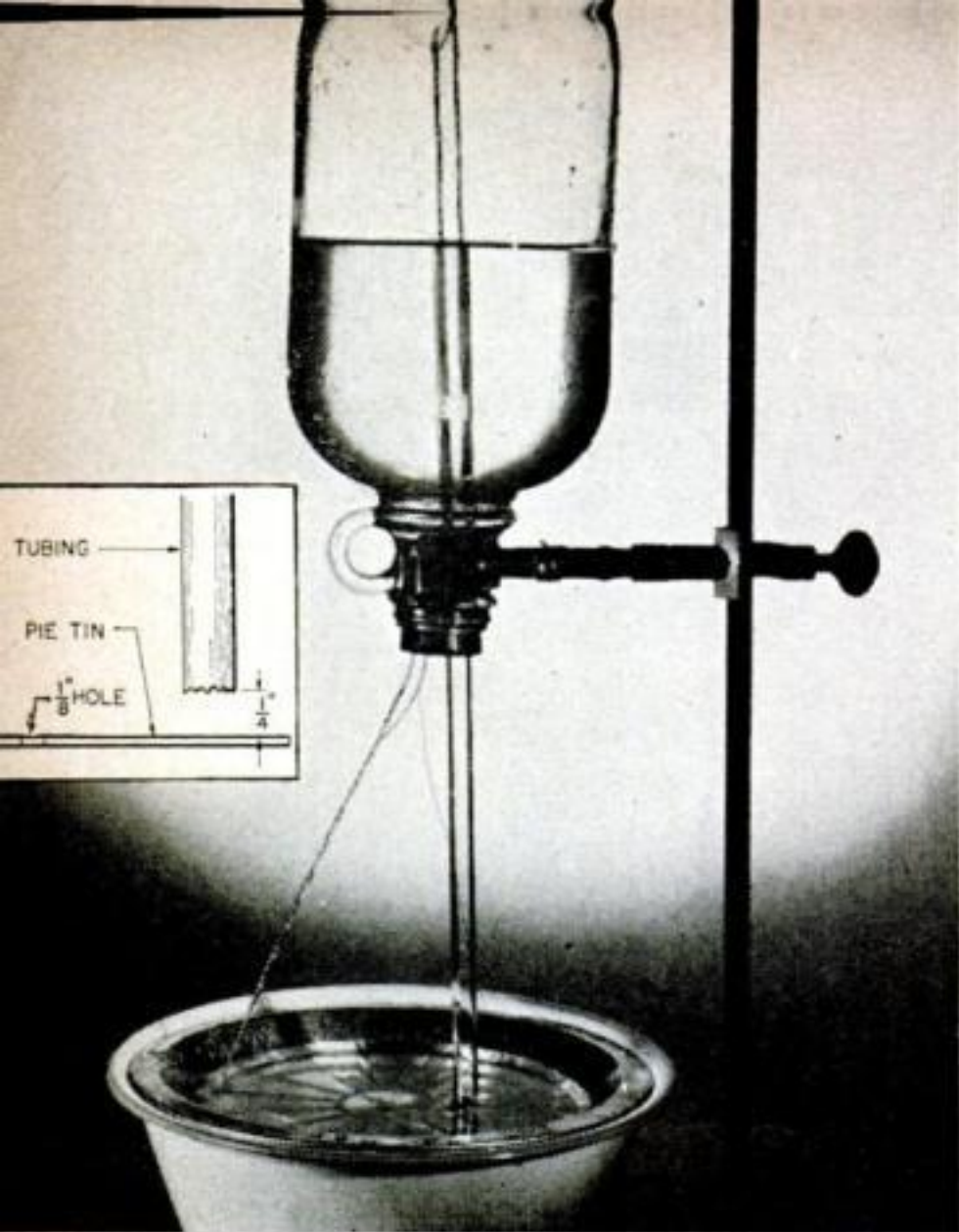
6063

How Science Plays Magician

Why Does the Fountain Stop?

Here's a fountain that flows, stops, and then flows again, intermittently, until all the water in the jug has run out.

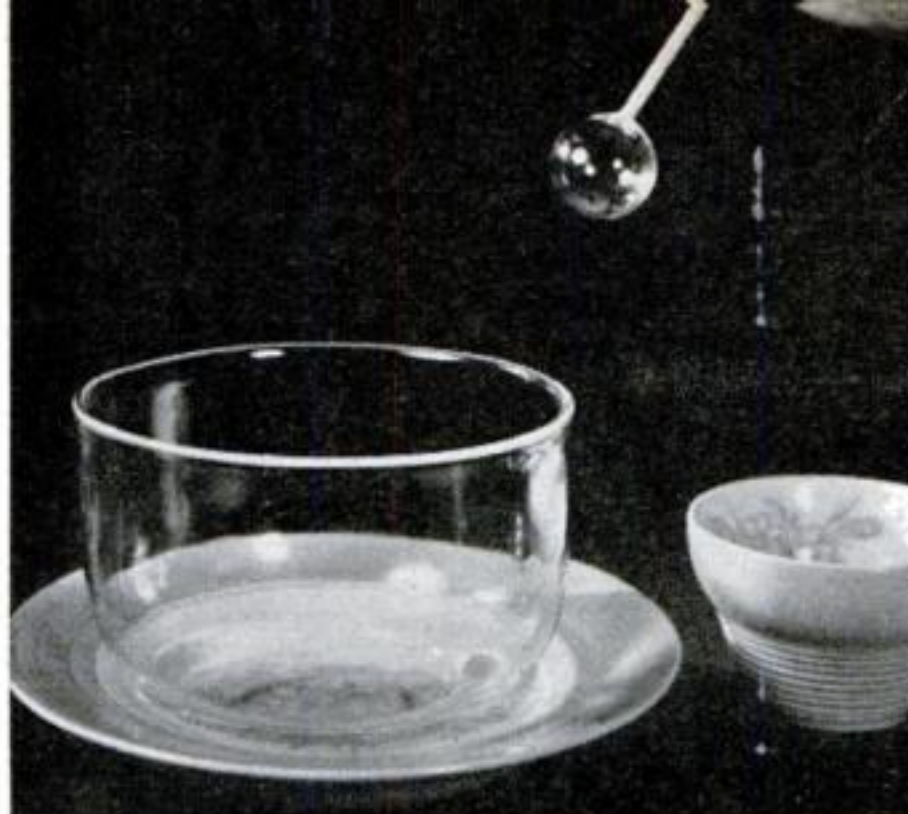
At first, water flows from the jet faster than it can escape through the $\frac{1}{8}$ " hole centered in the pie tin. When the level reaches the bottom of the long tube, water prevents air from entering the jug. This stops the flow from the jet. Soon, however, the end of the tube is again exposed and water spurts from the jet once more. The bottom of the tube should be slightly jagged to overcome surface tension.



What Makes the Wire Whirl?

This mysterious electric motor seemingly consists only of a copper wire loosely hung so its tip just touches a pool of mercury. When the second cell lead is touched to the mercury, right, the wire whirls in a circle.

The reason? A bar magnet, standing upright, is hidden in the jar. The magnetic field around the wire reacts with the field of the magnet. This causes the wire to be repelled in a circular orbit. Reversing the cell leads makes it whirl the other way.



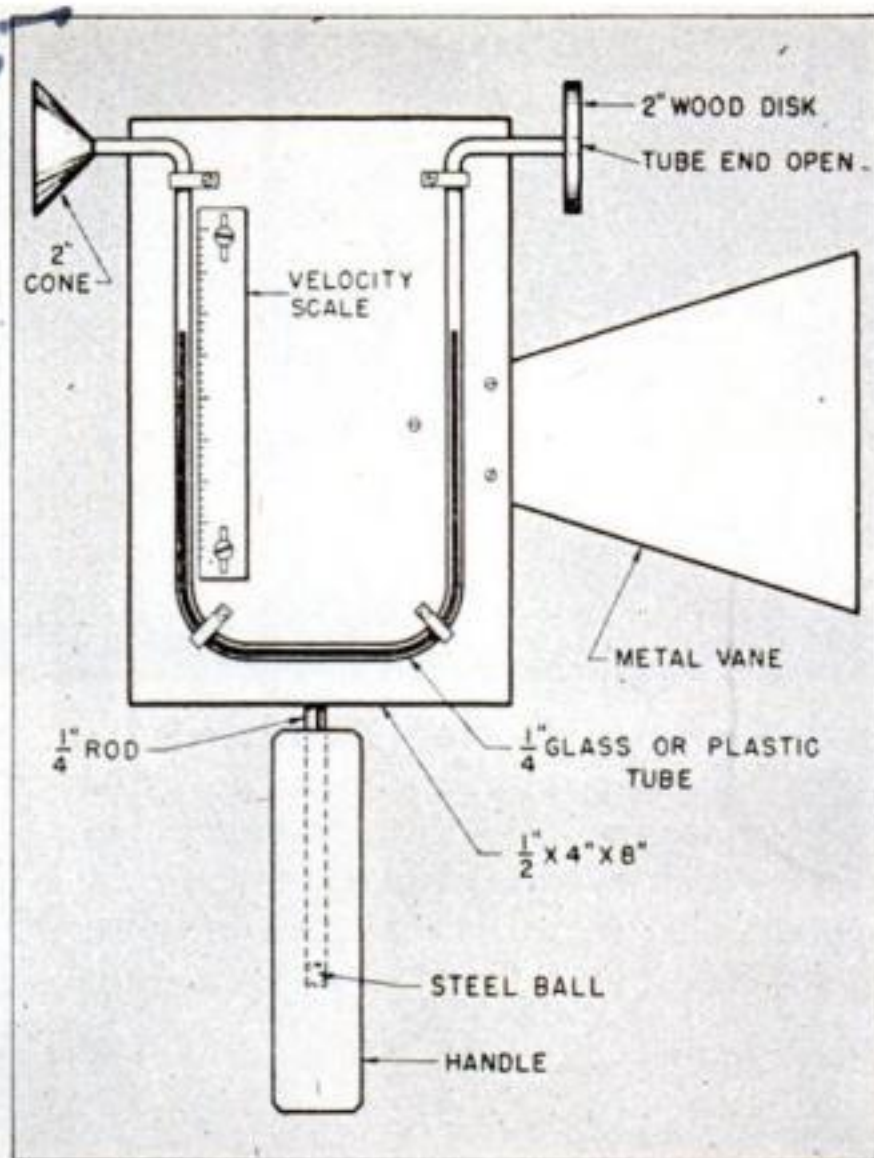
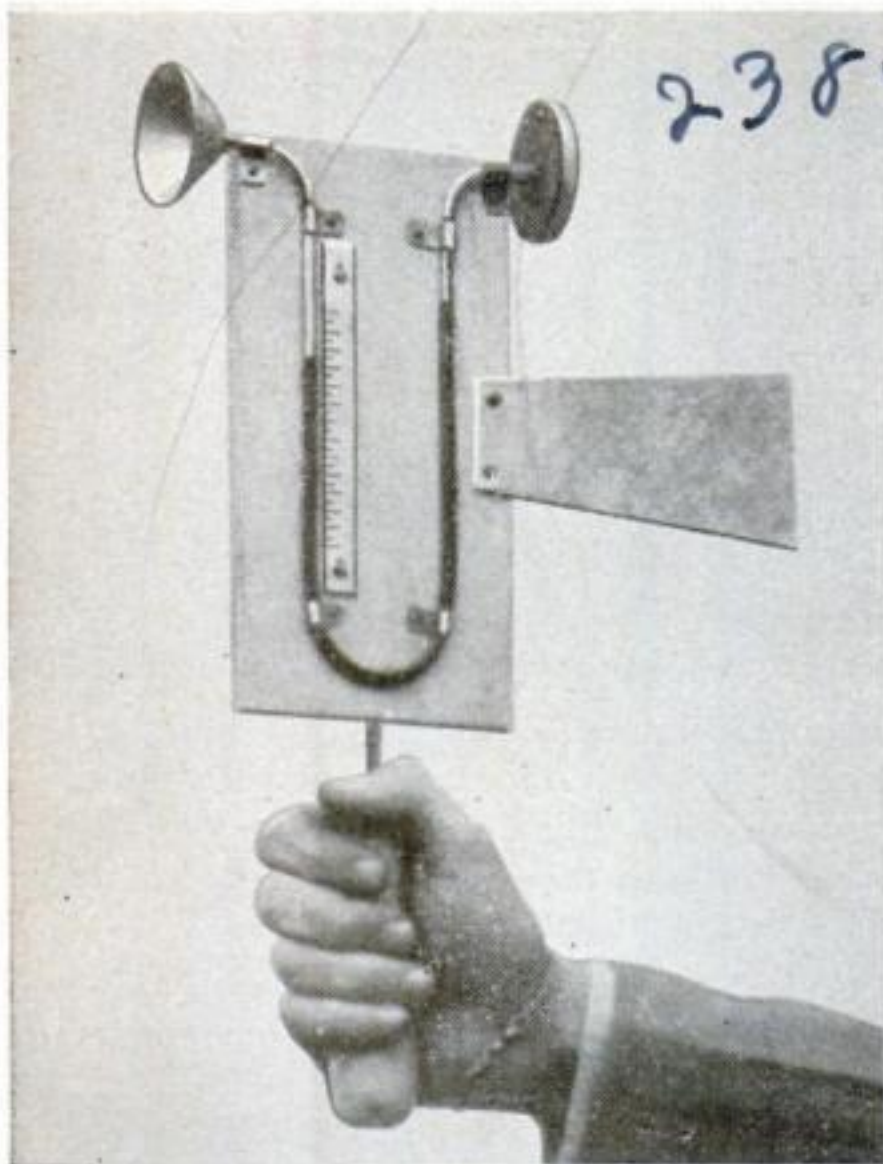
What Suspends the Bubble? It's easy to float soap bubbles on an invisible cushion of vapor. Cover the bottom of a deep dish or pan with carbon tetrachloride or noninflammable Carbona ®, set the dish

in a container of hot water, and allow to stand for several minutes until the liquid vaporizes. Then blow a bubble and gently drop it into the dish. It will appear to be suspended in midair.



Can You Fill This Cup? Here's a scientific version of the Cup of Tantalus. According to legend, this cup suddenly emptied itself just before reaching the parched lips of the king for whom it was named. Bend a glass tube to the shape of a question

mark. Then slip rubber tubing on the bottom end and press the rubber into the stem of the funnel. The funnel will now hold water until it rises to the top of the bent tube. At this point, siphon action starts and the water drains out.



Device Gauges Wind for the Amateur Weatherman

THIS anemometer is quite easy to build and reasonably accurate. By checking with a standard instrument, I found that at wind velocities below 10 m.p.h. its error ranged from 5 to 10 percent. At speeds above 10 m.p.h., the error did not exceed 5 percent.

Construction details are shown in the drawing. Bend the indicator tube from a 2' length of glass or clear plastic tubing with a $\frac{1}{4}$ " i.d. For a cone, use an old flashlight reflector. The 2" disk has a hole in the center to fit snugly over the open end of the

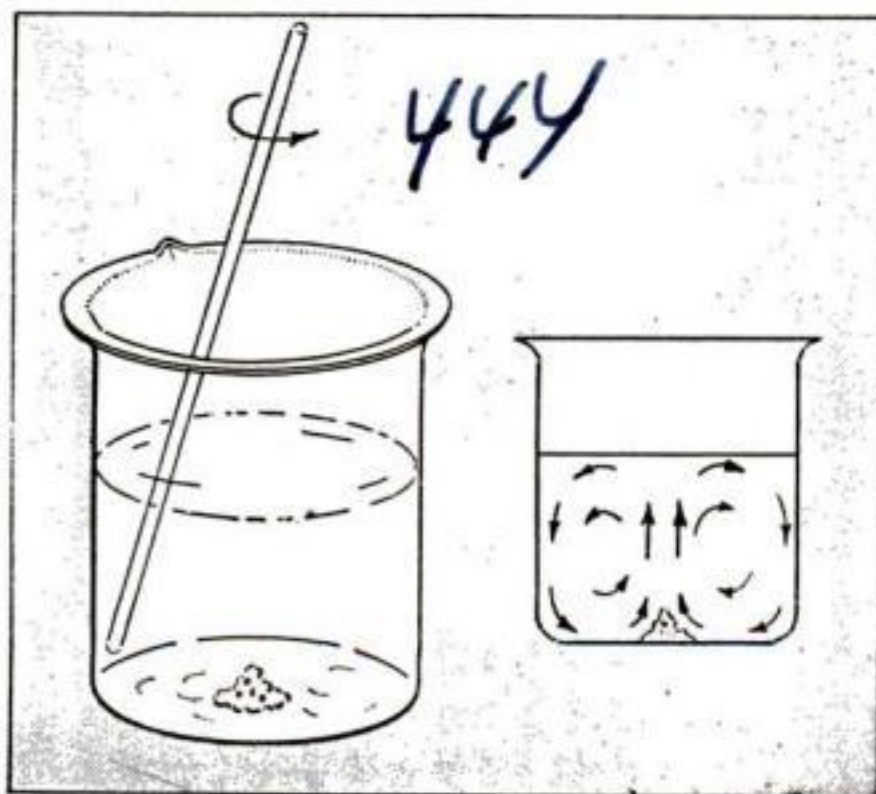
tube. Cement cone and disk in place. Drill the hole in the handle $\frac{1}{64}$ " larger than the $\frac{1}{4}$ " pivot rod. A strip of thin, soft metal will do for the scale.

Half fill the U-tube with colored water, noting the level exactly. Calibrate it at your local weather station or airport, scribing lines on the scale to correspond with various wind speeds. Another way is to hold it clear of a moving car on a windless day, recording speedometer readings. Keep the instrument level in use.—F. E. Averill, Silver Spring, Md.

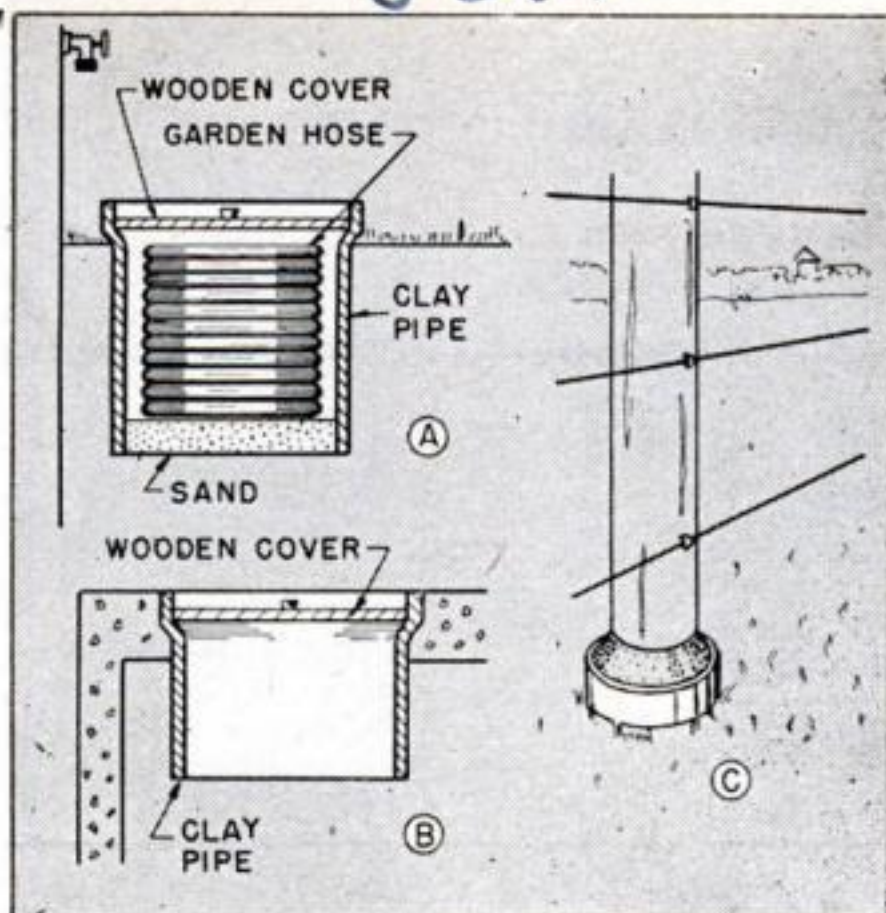
Secondary Currents Explain Centrifugal Paradox

WHEN a beaker of liquid containing undissolved solids is stirred with a circular motion, the solids collect in a central pile on the bottom of the beaker. This seems paradoxical: centrifugal force should apparently throw the solids out to the side of the beaker.

The answer lies in another circulation, in addition to the rotation, set up in the beaker. Greater friction of the liquid at the bottom causes it to rotate slower than at the top. The liquid then moves out from the upper center, down the sides, in toward the center of the bottom, and up at the center, depositing the solids in a pile in the quietest spot in the beaker.—D. H. Matheson, Hamilton, Ont.



5311



Clay Pipe Finds Uses on Farm

THE ample diameter and soil-resisting properties of vitrified clay pipe suggest a number of practical applications for leftover pieces. To make a storage place for a watering hose, bury a length of wide pipe bell end up. Put a layer of sand in the bottom for a drain, and cut a wooden cover (see sketch A). In a similar application, the pipe can be used to form a substantial cistern top, as in B.

Smaller sizes come in handy in prolonging the life of fence posts. Embedded in cement within a clay-pipe guard (C), the posts will be protected against soil acids. The cement should be tapered down from the posts.

5357



Small Engine Runs Cultivator

PARTS of an old plow make up the framework of this light garden tractor, built by W. G. Shackelford, of Vienna, W. Va. A $\frac{3}{4}$ -hp. engine drives it through two V-belts and a drum. With a herringbone pattern of lugs welded to the drum, enough traction is obtained to pull the teeth through relatively hard soil. The clutch is an adjustable idler, and depth of cut is regulated by raising and lowering the handles.

SHARPENING AXES

5755

[HANDY MAN]

If you have an axe to grind, here are some tips on how to go about it. They are recommended by the Norton Company, of Worcester, Mass., makers of abrasives and grinding wheels.

Sharpen the axe on a slowly rotating sandstone or suitable artificial abrasive wheel. Be sure to keep the wheel very wet. Remember that the temper of the cutting edge can easily be drawn or softened in regrinding.

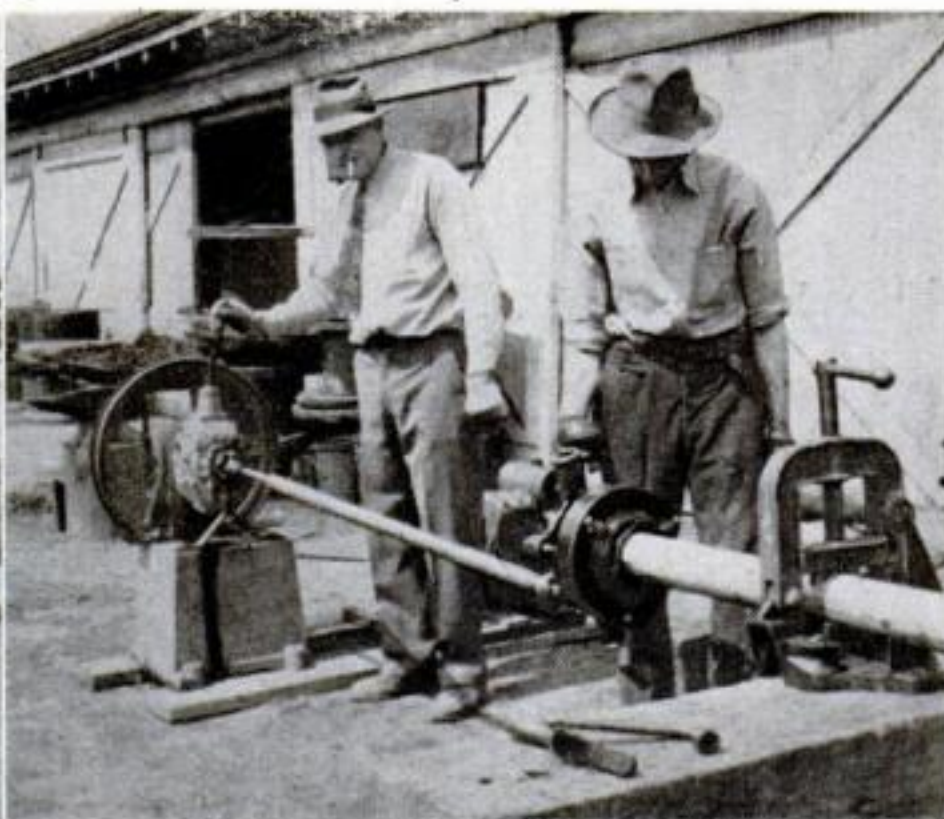
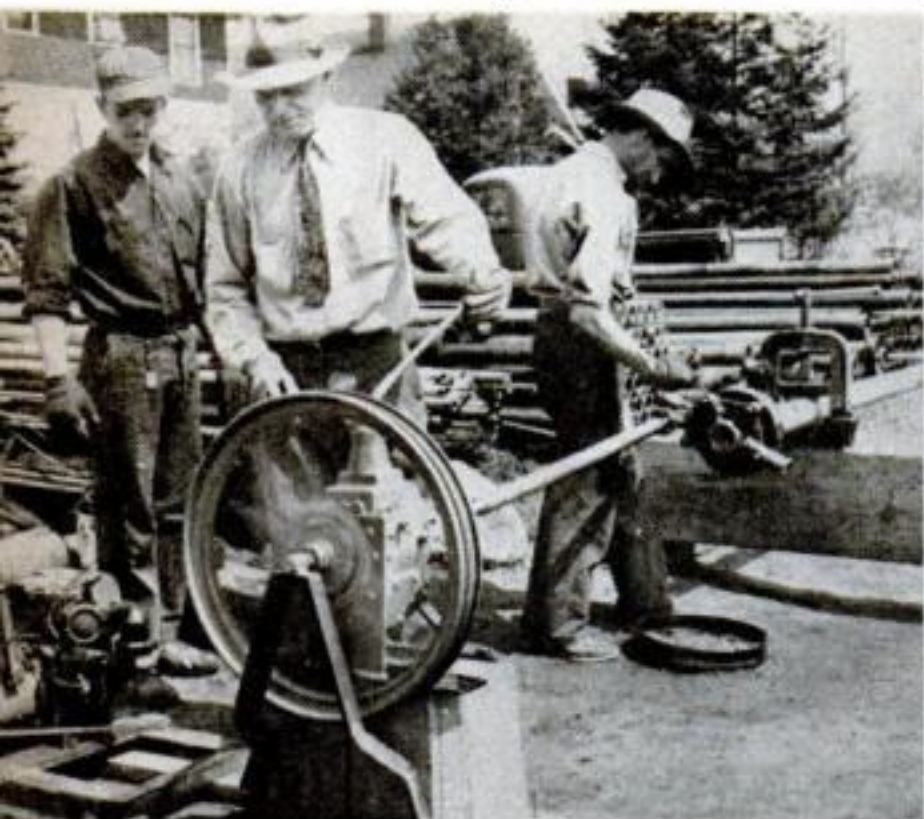
Start to grind from 2" to 3" back from the cutting edge and grind to about $\frac{1}{2}$ " from the edge. Work for a fan-shaped effect, leaving the corners reinforced for strength. Then grind a rounded, convex bevel down to the edge. Never grind the bit concave; this leaves the edge with insufficient support and it will break easily. Each time the axe is used, hone or touch up the edge with a handstone.

Here are some don'ts:

Never grind an axe on a high-speed or dry wheel. The heat generated is very likely to draw the temper and soften the edge. Don't use an axe head for pounding. The heads are not made for such use and they may split or break at the eye. Do not use an axe as a wedge. The result may be the same as if it were used for pounding. Finally, do not strike sideways with an axe. Axes are made to resist shock lengthwise of the head, not to withstand severe sideways blows.

POPULAR SCIENCE MONTHLY SHOP DATA

6035

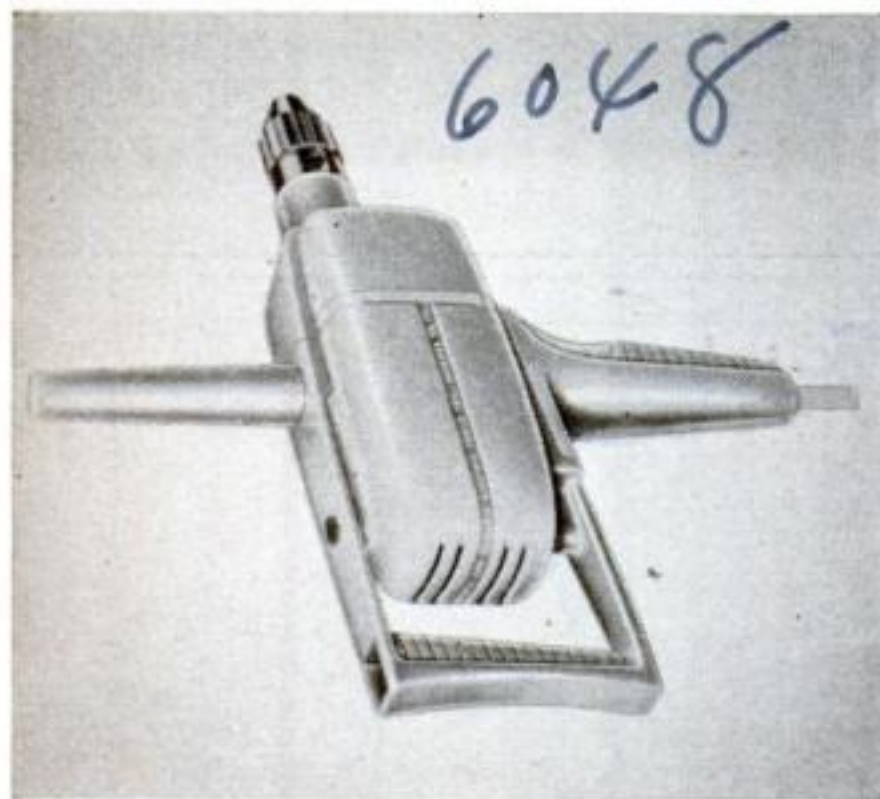


Homemade Pipe Threader Uses Car Transmission

AN INGENIOUS machine for cutting threads in large pipe has been devised by Walter A. Gustafson, well driller of Washburn, Wis. The power source is a 2½-hp. gasoline engine, belt-driving a 24" Model-T Ford wheel attached to the front end of a Chevrolet truck transmission. Between the transmission and threading die is a 5½' steel shaft with a universal joint at each end. A square socket at the outer end engages the die.

For cutting threads the transmission is

shifted to reverse; the rig swiftly and smoothly threads steel pipe up to 6" in diameter. Then the transmission is shifted to second, or to high with reduced engine speed, backing off the die at a fast clip. On 4" pipe the machine, operated by one man, makes about 6 cuts per hour, compared to 3 cuts an hour made by two men working by hand. The fast back-off rate, Gustafson says, is an improvement on conventional pipe-threading machines.—C. M. Sheridan, Washburn, Wis.



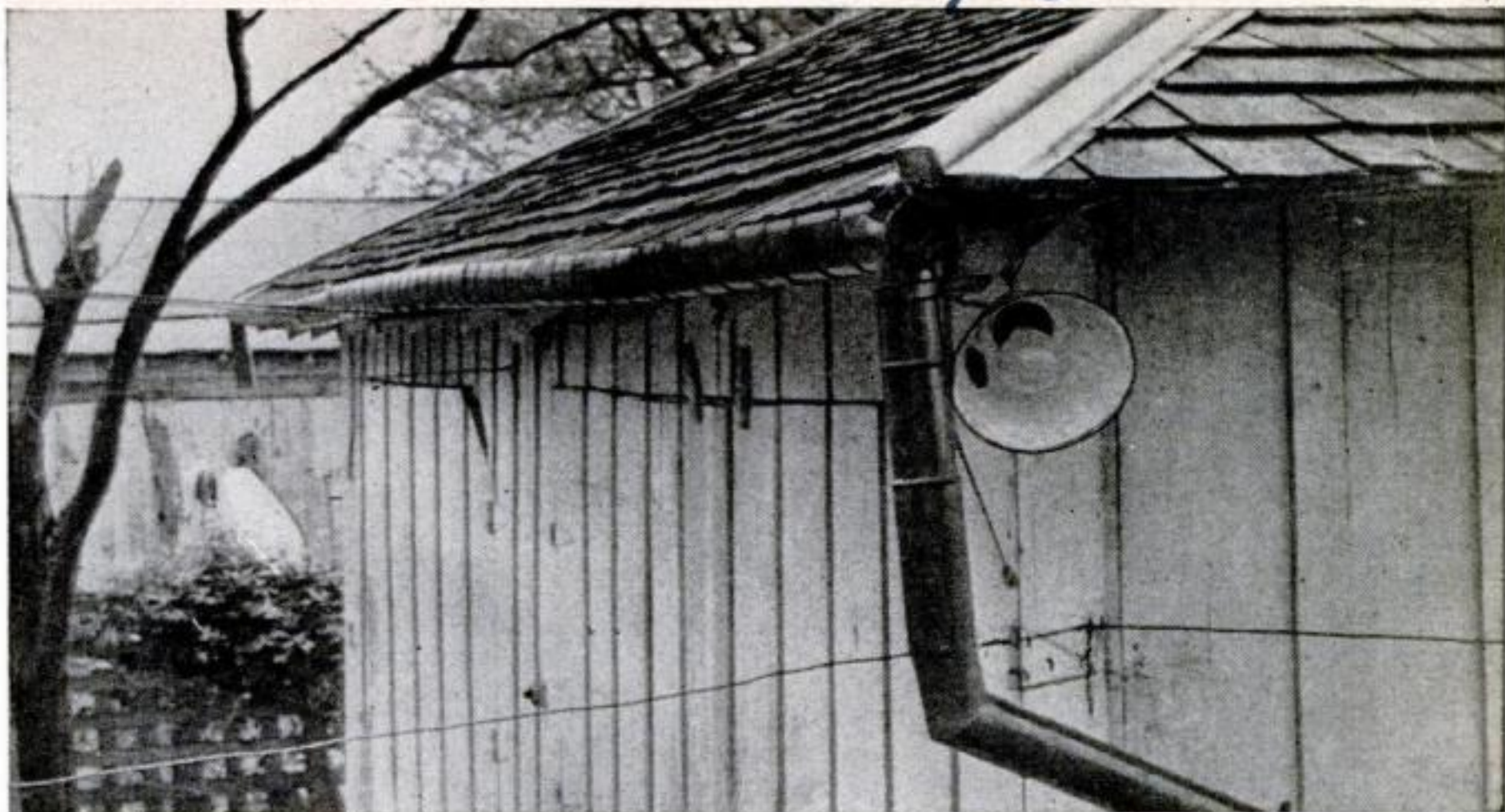
New 1½" Drill Weighs 9 lb.

COMBINING lightness and handiness with full ½"-drill power, this new drill made by Portable Electric Tools, Inc., Chicago, weighs 9 lb. and has a demountable handle for work in tight spots. At a full load speed of 240 r.p.m., it handles a ½" drill in steel, a 1" bit in hardwood, or a hole saw up to 2½" in diameter.



Stakes Help in Painting Pipe

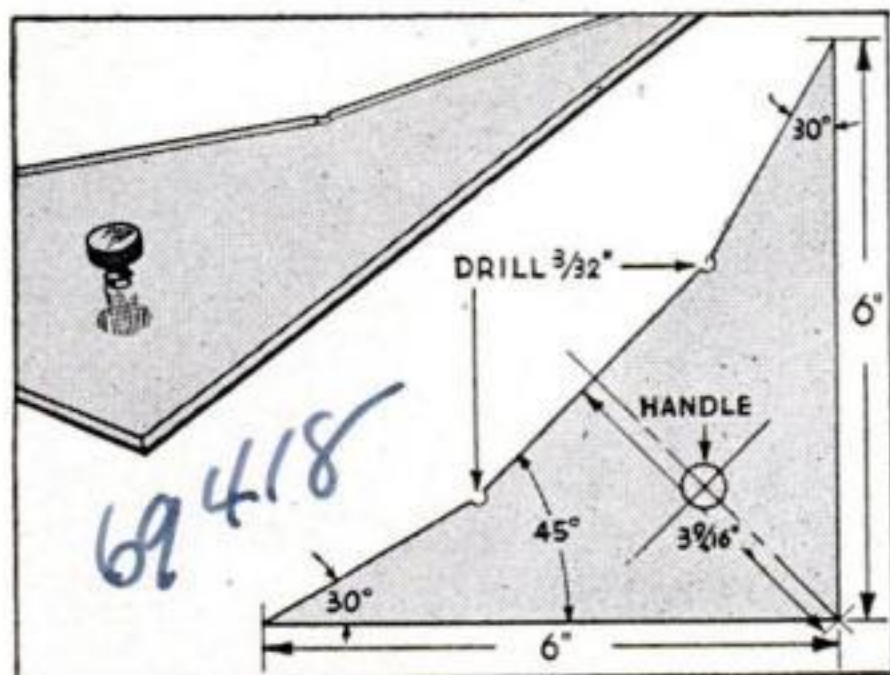
PAINTING those awkward "galvanized eels" known as conductor or gutter pipes is greatly aided by a pair of short stakes through which large nails have been driven. With one stake driven in solidly, slide the pipe on its nail, engage the other nail in the pipe, and tap the stake down.—Willard Rood, Jamaica Plain, Mass.



Beer Cans Form Garage Gutter and Downspout

THE inside of this 20' gutter, which is made of coated beer cans, required no painting. I first cut out both ends of all the cans, and then soldered together enough at one time to make a 3' section, keeping the seams aligned. This length was then cut open

alongside the seams and the cut spread apart 1" before adding more cans. The gutter is fastened under the eaves with metal straps and painted outside to match the roof. For the spout, only the ends are cut out.—*H. E. Richter, San Antonio, Texas.*



Drawing Aid Has Three Angles

THIS drafting tool gives you three of the angles most commonly used in mechanical drawing—30, 45, and 90 deg. It can of course be made in other sizes than the 6" one detailed above.

Scribe the layout on $\frac{1}{8}$ " clear plastic after removing the masking paper. Drill two small holes at the points indicated. Scribe the lines deeper, place so the waste overhangs an edge, and snap off as you would glass. Smooth edges with a fine file. Cement or bolt on a knob as a handle.—*Harry S. Keehne, Traverse City, Mich.*



Drawers Lick Cabinet Problem

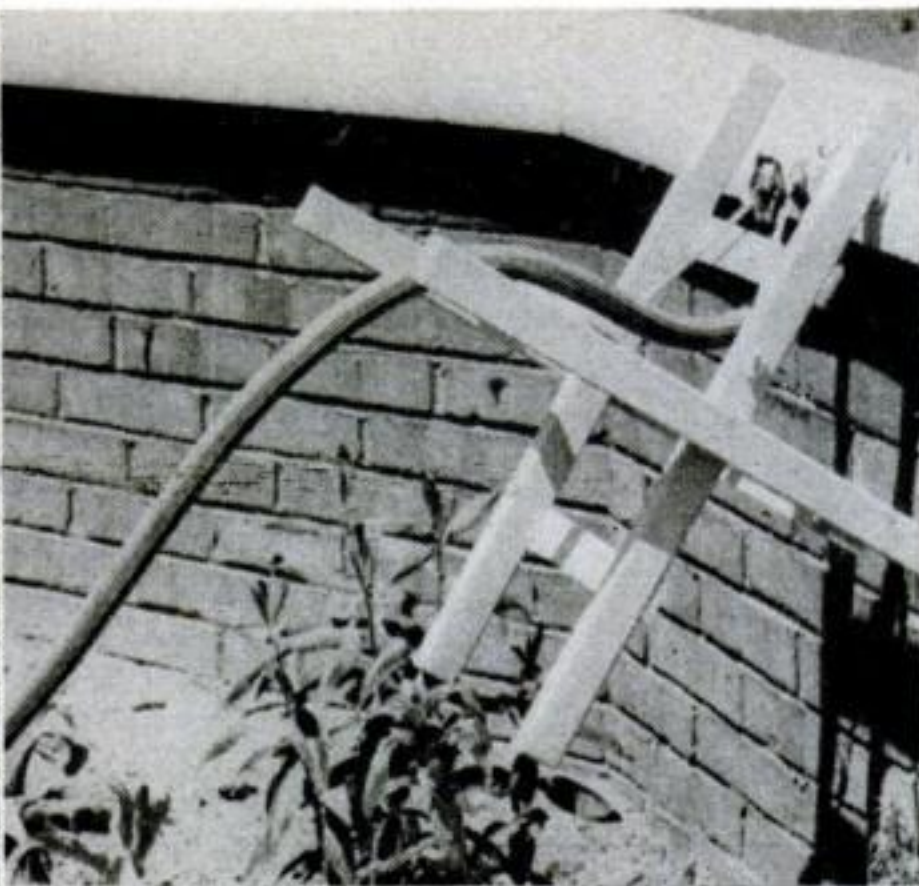
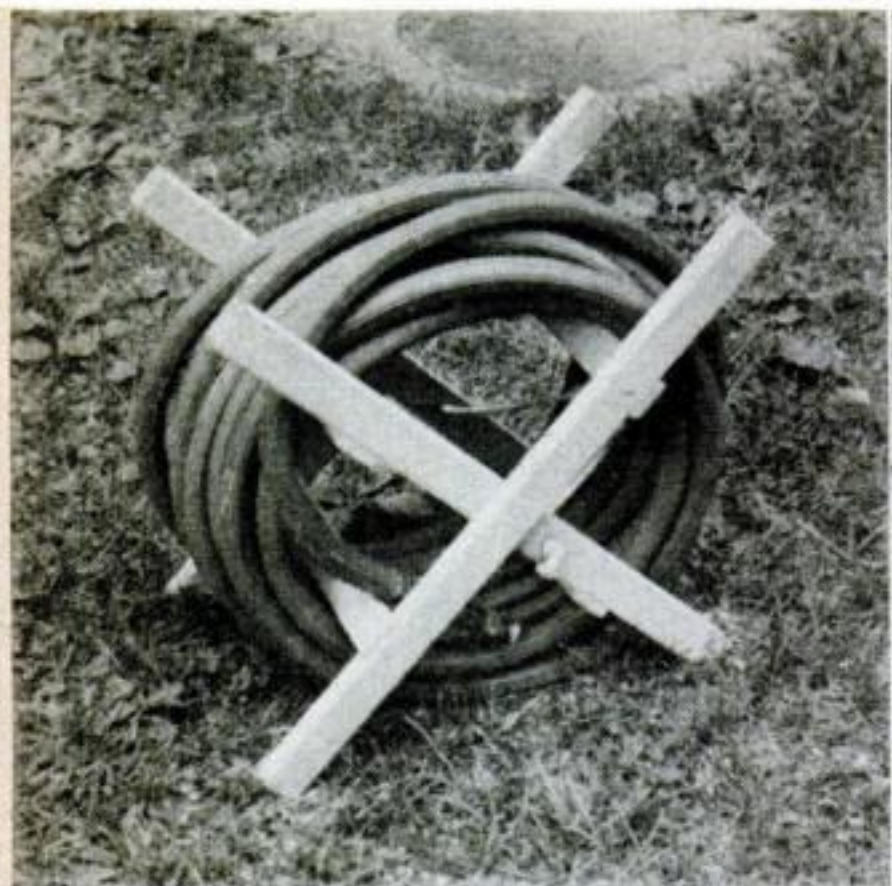
EVERY time I reached for the shaving cream in our medicine cabinet, I was showered with curlers, eyebrow pencils, and face powder. This didn't start the day well. To fix things, I built three small plastic drawers, two narrow ones for my wife's cosmetics and a wide one for shaving things. The transparent fronts readily show what's inside.—*David S. Loeb, Philadelphia.*

Let Hot Plastic Cool in Air

IT'S BEST to resist the temptation to toss heat-shaped plastic into water for cooling. Occasionally such treatment may develop stresses that crack the material.

gratis

6791



Reel for Storing Garden Hose Hangs on Faucet

THIS reel stores up to 50' of garden hose and hangs against the house to keep the hose from dragging over plants set beneath the faucet. The reel has four $\frac{3}{4}$ " by $1\frac{1}{2}$ " by 22" legs separated by four stretchers to give it an inside width of 8". Drill holes in two of

the legs and knot in a length of rope to permit hanging the reel from the sill cock. Nail and glue the joints and give the wood a couple of coats of paint to protect it against moisture. For storage, a wire hook holds the hose end.—Robert Hoppough, Waukegan, Ill.

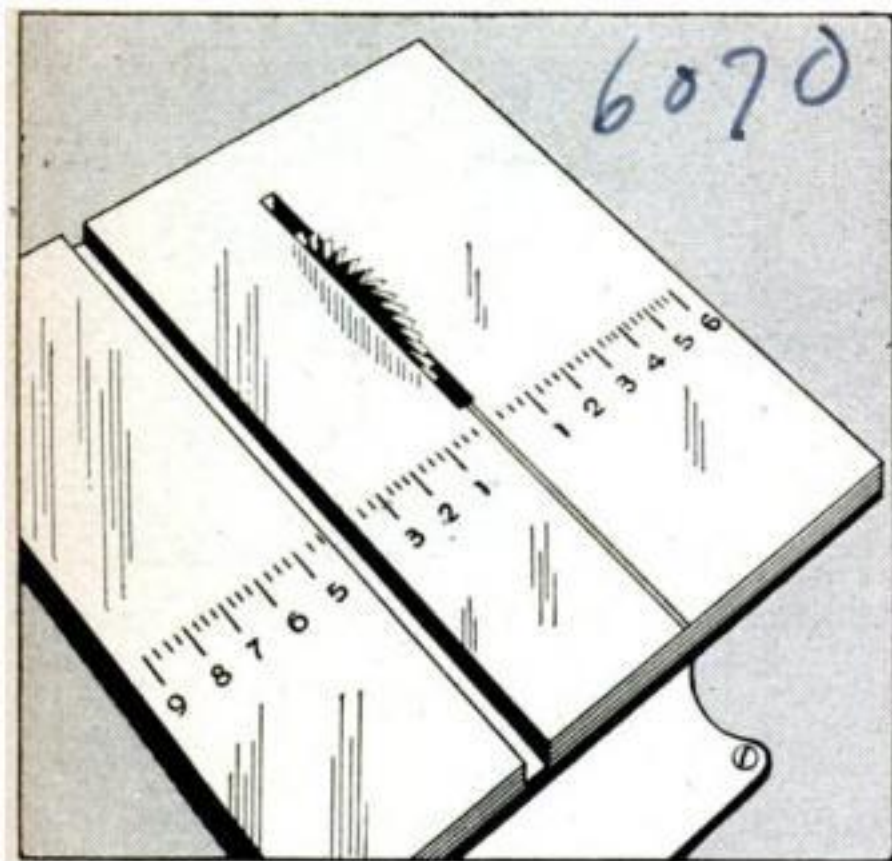
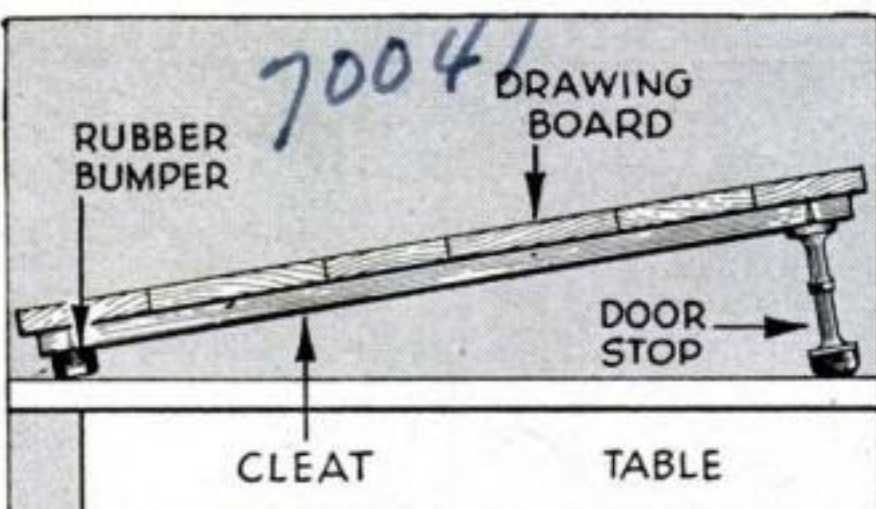


Table Marks Aid in Sawing

GUIDE scales and a saw-cut line scribed or painted on the table of a bench saw will speed up the making of rough cuts. Lay a straightedge along each side of the blade to locate the cutting line and approximate kerf width. Next lay out inch marks and smaller divisions on each side of this line. Recheck measurements if the blade is replaced with a heavier one or if the tooth set is different.—Fred C. Young, Sandy Spring, Md.



Slanting a Drawing Board

Two rubber bumpers—the kind that can be bought in plumbing shops for use on toilet seats—and two doorstops will hold a drawing board at a good angle on a desk or table. They'll also protect the surface on which the board rests. Use a thin cleat down each side of the board and screw on the parts.—M. W. Bossman, Dayton, Ohio.

Cleaning Drafting Equipment

T-SQUARES, scales, triangles, French curves, and other drafting tools can be cleaned quickly with cigarette-lighter fluid. Keep it in a bottle that has an applicator on the end of the cork. This setup also is handy in removing the remains of cellulose tape.

69810

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4. Last—a steel jacket. This completes an air-tight seal, to stop corrosion and keep the battery fresh and powerful. Only Ray-O-Vac builds batteries with all four of these safeguards.

GUARANTEE on every Ray-O-Vac Leak Proof:
"If your flashlight is damaged by corrosion, leakage or swelling of this battery, send it to us with the batteries and we will give you FREE a new, comparable flashlight with batteries."

Ask for Ray-O-Vac Leak Proofs

Buy Spares... *they stay fresh*



You won't miss with the big, unusually brilliant ground-glass view finder—you see your picture as you take it.



You catch fast action shots when you convert the focusing hood to open, eye-level frame finder.



You get exciting flash pictures with accessory Kodak Flashholder—shutter has built-in synchronization.



You focus to a hair with the magnifier set into the finder hood—handy for critical close-ups.

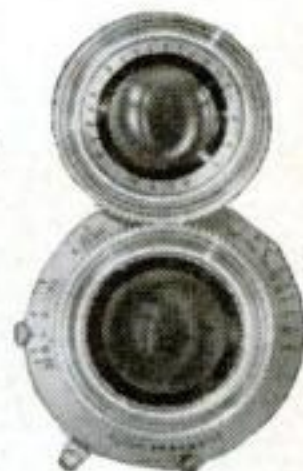
Prices subject to change without notice

EASTMAN KODAK CO., ROCHESTER 4, N. Y.

KODAK REFLEX CAMERA



You check all settings quickly—depth-of-field scale, lens and shutter speeds—plainly marked and easily adjusted.



You have wide range of operation—twin Kodak Anastar f/3.5 Lumenized Lenses; 7 stops from f/3.5 to f/22; 7 speeds from 1/2 to 1/200 second.



You're up-to-date with modern reflex styling and rugged, die-cast aluminum construction.



Smart Field Case included with camera. Price \$120 plus tax; Flashholder, \$9.50 plus tax. Your Kodak dealer has yours in stock now.

"Kodak" is a trade-mark

Kodak

INSTANTLY CONVERTS LINEAR FEET TO BOARD FEET



Solves many other
woodworking problems
in seconds
only **10¢**

Easy to use. Fast . . . simply set dial of GREENLEE Handy Calculator to get measurements; slope per foot in degrees; comparative hardness, weights and workability of various woods; bit sizes; nail specifications; tool sharpening hints. 6" diameter heavy varnished cardboard. Special offer by maker of famous GREENLEE tools. Send 10¢ to Greenlee Tool Co., 2130 Columbia Avenue, Rockford, Illinois.

TOOLS FOR CRAFTSMEN
GREENLEE



Nylon Cleans Condensers

A NEW way to clean steam-condenser tubes, shown above, uses nylon brushes instead of metal or rubber plugs. This not only saves time but is better for the tubes, says the West Penn Power Co., which developed the process. A brush, with a cone-shaped steel washer welded to its pushing end, is shot through each of the tubes by water delivered from a nozzlelike gun under 200-lb. pressure. Using this method, it has been found, two men can clean a condenser containing 5,681 tubes, each 18 to 24 feet long, in two eight-hour shifts.

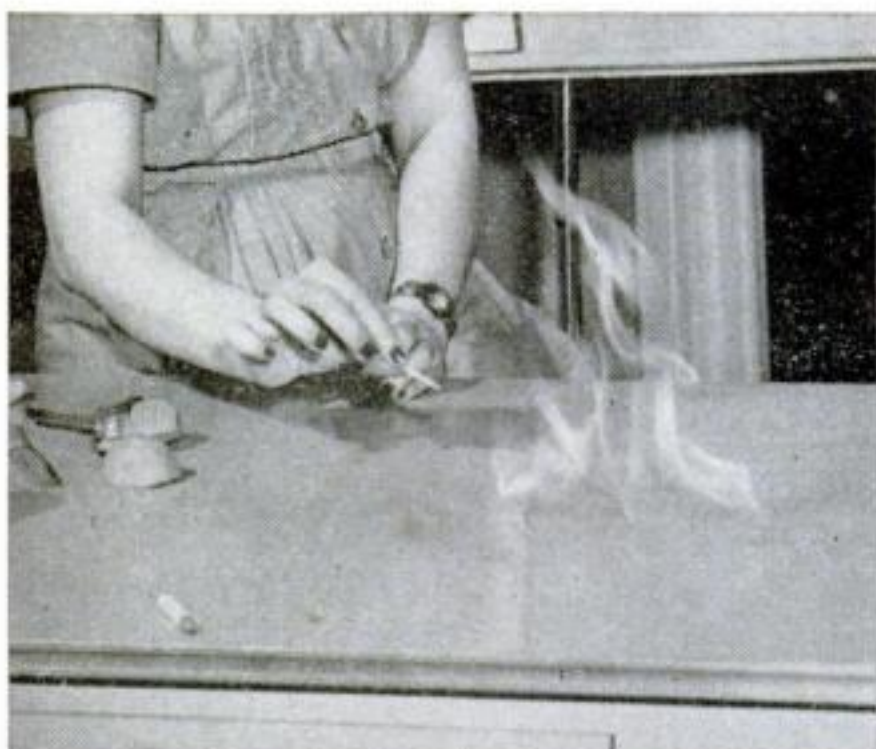


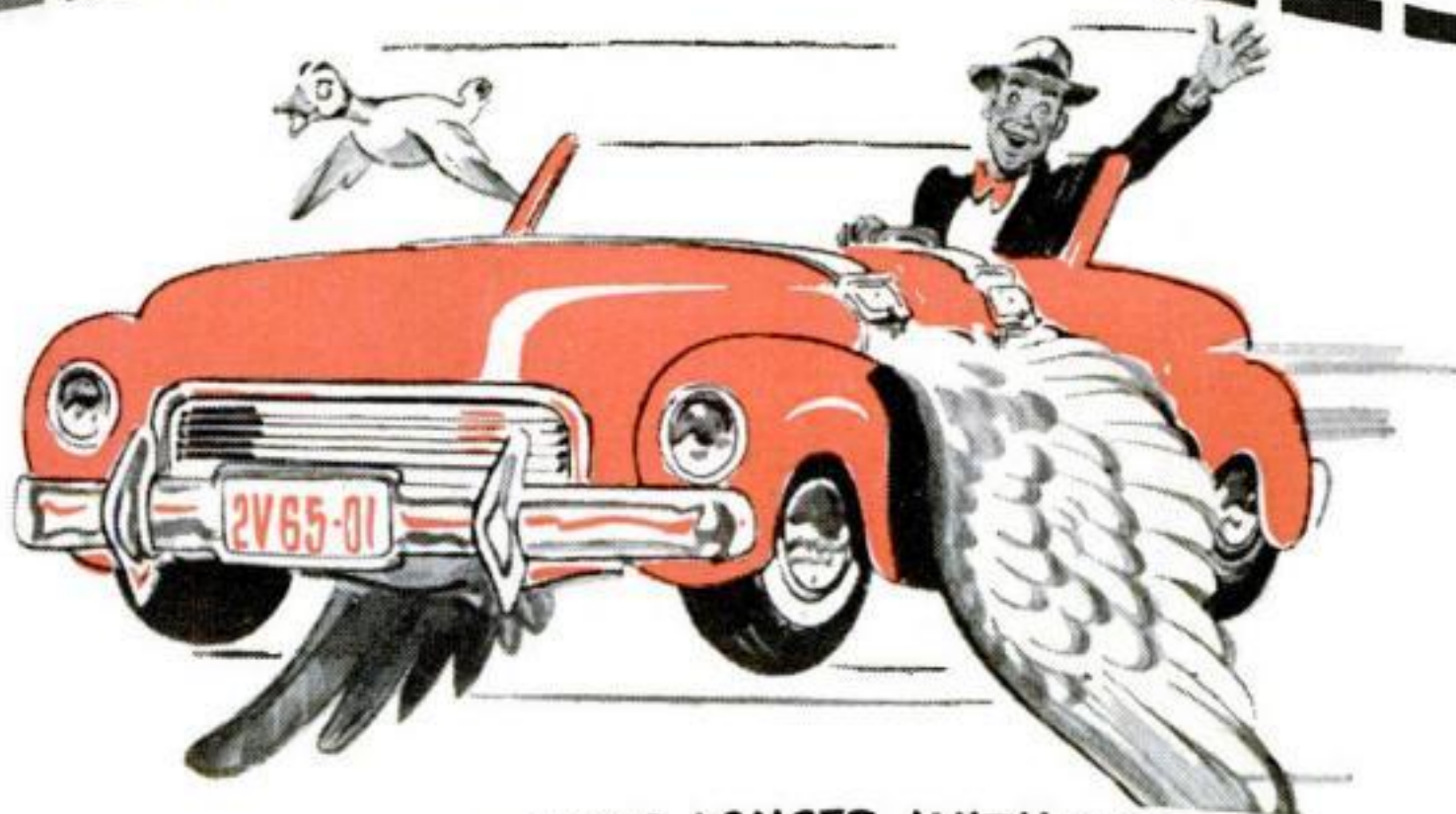
Table Top Won't Char

THIS new top for kitchen tables, made of laminated plastic, resists chipping, heat, stains, and acid. As shown by the test pictured above, even flames and burning cigarettes leave no mark. The Daystrom Corp. makes the table top of seven layers of plastic impregnated with resins.

IF YOUR CARPENTRY TURNS
OUT LIKE THIS...IT'S TIME TO
CHECK THE BLUEPRINTS ...

AND

IF YOUR CAR FEELS LIKE THIS...
IT'S TIME FOR **MARFAK**
CHASSIS LUBRICATION



THAT CUSHIONY FEELING LASTS LONGER WITH MARFAK!

Marfak "sticks to the job," protecting costly bearings and wear points — not for just a hundred miles or so, but for 1,000 miles and more. Tough, longer-lasting *Marfak* is specially compounded to resist wash-out, squeeze-out, shock. You can *feel* this difference in a smoother "cushiony" ride and effortless handling. Ask for *Marfak* Lubrication today at your neighborhood Texaco Dealer, the best friend your car ever had.



THE TEXAS COMPANY
TEXACO DEALERS IN ALL 48 STATES

Texaco Products are also distributed in Canada

Tune in . . . TEXACO STAR THEATER every Wednesday night starring Milton Berle. See newspaper for time and station.

OCTOBER 1948 245

What's Your choice?...

of these sturdy, dependable
Low-Cost
Marlin .22's

TUBULAR MAGAZINE
18-25 shots on one loading
\$26.95*
*Price slightly higher
west of the Rockies.

MARLIN MODEL 81-DL

Shooting efficiency, with *least* fuss and bother! Magazine holds a load for a full day's hunting. Patented non-jamming feed. Shoots .22 short, long and long rifle cartridges—regular and high speed without adjustment. Quick-release trigger—self-cocking action—side ejection—Off and On safety—American walnut stock. Available with peep sight or open sights; sling strap swivels.



Unbeatable for pests and vermin...owls, rats, hawks and crows, the 81-DL carries up to 25 shots.

BOYS!

Be a ranger. Write Sportsmen's Service Bureau, 343 Lexington Avenue, New York, for FREE booklet.

NEW Marlin Catalog, with complete specifications, now available. Enclose 10 cents with name and address.

246 POPULAR SCIENCE

CLIP MAGAZINE
for rapid fire

\$22.90*
*Price slightly higher
west of the Rockies.

MARLIN MODEL 80-DL

Whale of a value—this man-sized .22 repeater! Ready for instant action on vermin or small game. 8 rapid-fire shots to get 'em, no matter how fast they run. Quick-release trigger—self-cocking action—side ejection—Off and On safety—American walnut stock. Available with peep sight or open sights; sling strap swivels. More sport for your money with Marlin's 80-DL!



Marlin's 80-DL is a sure getter of woodchuck, raccoons, rabbits and other fur-bearing game.

THE MARLIN FIREARMS CO. • NEW HAVEN, CONN.

SPORTSMEN'S SET—collar and tie clasp—real jewelry, richly gold-plated Yours for only 50¢ with box top of Marlin Blades; 25¢ with 3 box tops. Address Dept. 36, MARLIN, New Haven, Conn.



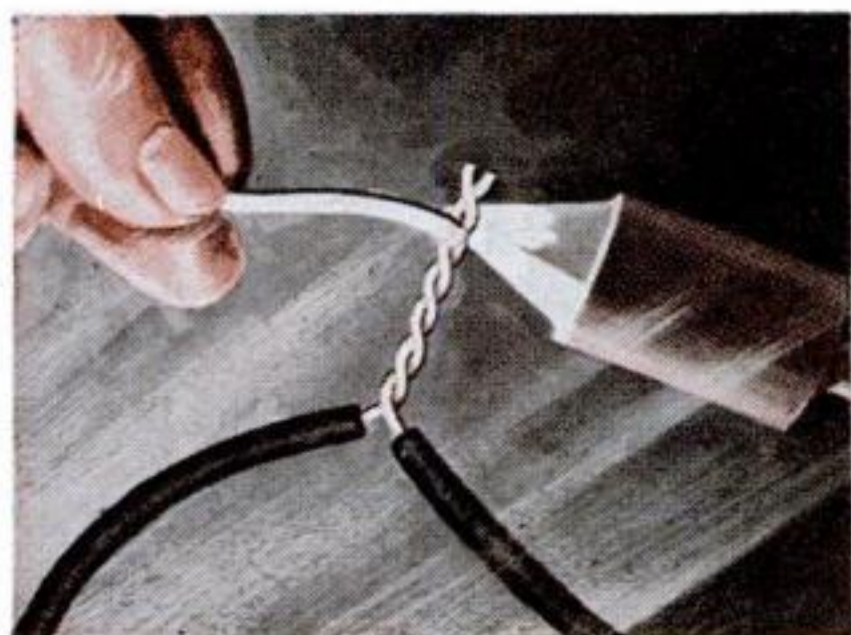
BEST WAY TO SOLDER WIRE



1 Be sure current is disconnected. Then, take your flashlight, powered with "Eveready" batteries, and find the broken wire. Next, prop up your flashlight so that it will shine brilliantly on your work.



2 Make sure wire ends are clean and bright... twist wires to form a joint that is mechanically strong enough to be self-supporting. (It's a common mistake to let solder serve as a strength binder.)



3 Use a hot iron with the copper tip well tinned. Don't drip the solder on the joint—apply the soldering iron *underneath* the joint and heat the wires until they melt the solder. Apply a moderate amount of solder. After it has flowed freely through the wire strands, remove the iron.

BEST WAY TO LOAD YOUR FLASHLIGHT

For fixing your radio . . . car wiring . . . any job requiring portable light . . . be sure to load your flashlight with long-life "Eveready" batteries.



"EVEREADY" FLASHLIGHT BATTERIES

The trade-mark "Eveready" distinguishes products of
NATIONAL CARBON COMPANY, INC.

30 East 42nd Street, New York 17, N. Y.

Unit of Union Carbide **UCC** and Carbon Corporation



NEW "flight-smooth" comfort that irons out bumps like magic!

NEW "road-hug" stability that makes handling easy and sure!

NEW "sure-grip" steering that gives positive control at all speeds!

NEW "feather-touch" braking that provides stopping power to spare!

NEW "speed look" that makes people stop, look and envy!

NEW unmatched performance for greatest fun and thrills!

HARLEY-DAVIDSON... WORLD'S CHAMPION MOTORCYCLE

1949 HARLEY-DAVIDSON

with the new

HYDRA-GLIDE FORK!

HERE'S *your* motorcycle . . . with all the comfort and performance features you ever dreamed of . . . with the sleek, trim, modernly beautiful lines that catch the eye of the girl friend . . . the power, stability and handling ease for which Harley-Davidson Motorcycles have always been famed!

The 1949 Harley-Davidson is sensationally advanced! New Hydra-Glide Fork brings you unheard-of comfort on roughest roads, "road-hugging" control, effortless steering ease. Bigger, faster-action brakes give you increased stopping power. Sealed ray headlight turns night into day. Air flow fenders give you protection in any kind of going. Many other features add to your comfort and pleasure . . . take you into a new world of motorcycling performance, thrills and fun. It's the kind of motorcycle only the finest engineering and most modern production methods can produce. Here it is . . . greatest of a long line of great Harley-Davidsons. *Your* motorcycle! See your dealer today and take a ride.

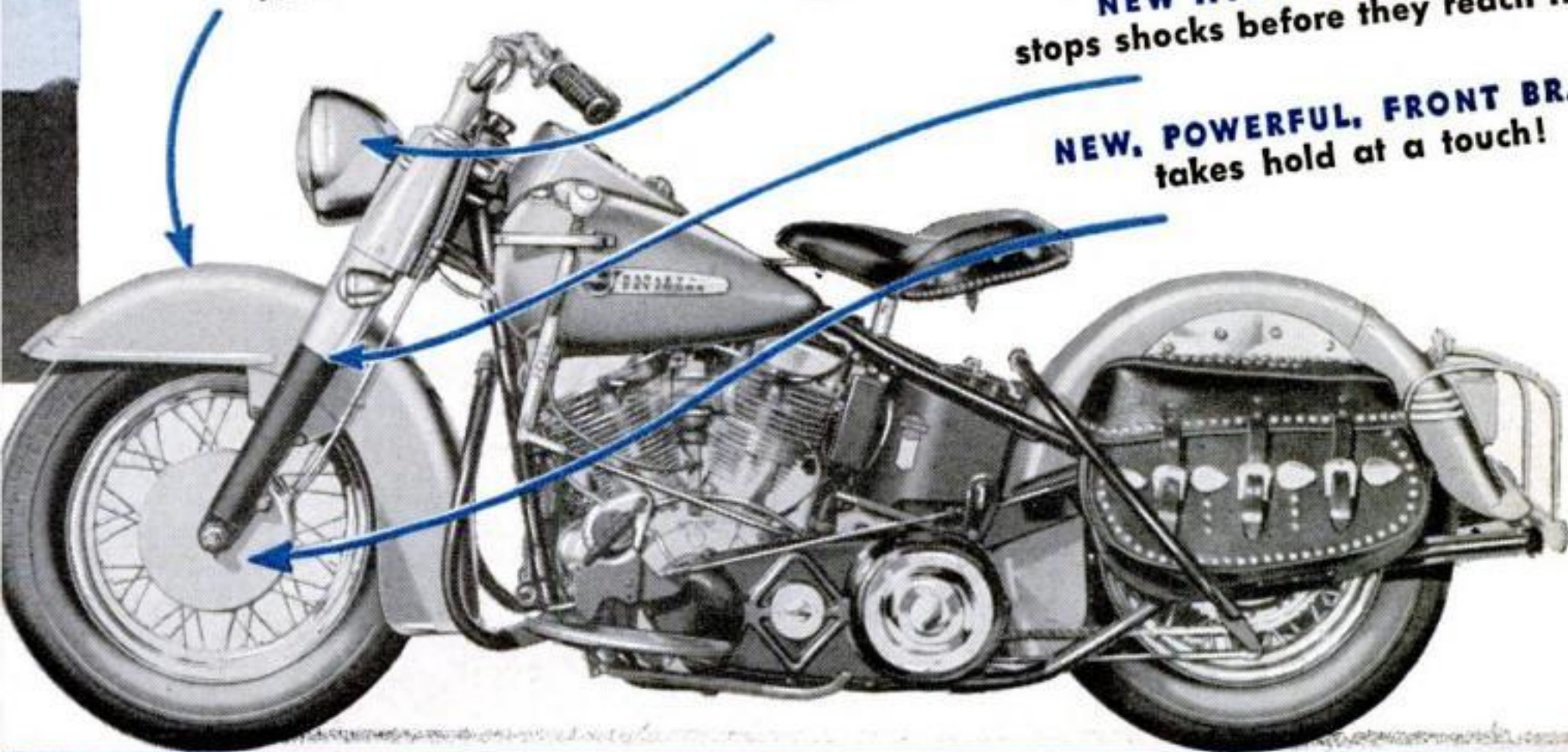
HARLEY-DAVIDSON MOTOR CO., Dept. PS, Milwaukee 1, Wis.

NEW AIR FLOW FENDERS
for streamlined beauty!

NEW SEALED RAY HEADLIGHT
turns night into day!

NEW HYDRA-GLIDE FORK
stops shocks before they reach rider!

NEW, POWERFUL, FRONT BRAKE
takes hold at a touch!



Get More FOR YOUR Money!

WITH A NEW



8" TABLE SAW

CUTS 2 5/8"
WITH 8" BLADE

LARGE SEMI-STEEL TABLE
18" x 25"



TABLE TILTS
TO FULL 45°

RUGGED
CONSTRUCTION

\$54⁵⁰

WITH BLADE, GUARD
AND SPLITTER

SEALED - FOR - LIFE BALL BEARINGS

Here is the key tool for every woodworking shop. Built for years of dependable service. Every feature you've wanted for straight and angular sawing and dado work has been included in this Foster Table Saw to help you do better work faster.

GET A FREE CATALOG!

See Foster's New TABLE SAWS,
JIG SAWS, BAND SAWS, JOINTERS,
DRILL PRESSES, LATHES, PLANERS,
SHAPERS AND SANDERS.

FOSTER MANUFACTURING CO.

1 KINSEY AVE., BUFFALO 17, N. Y.

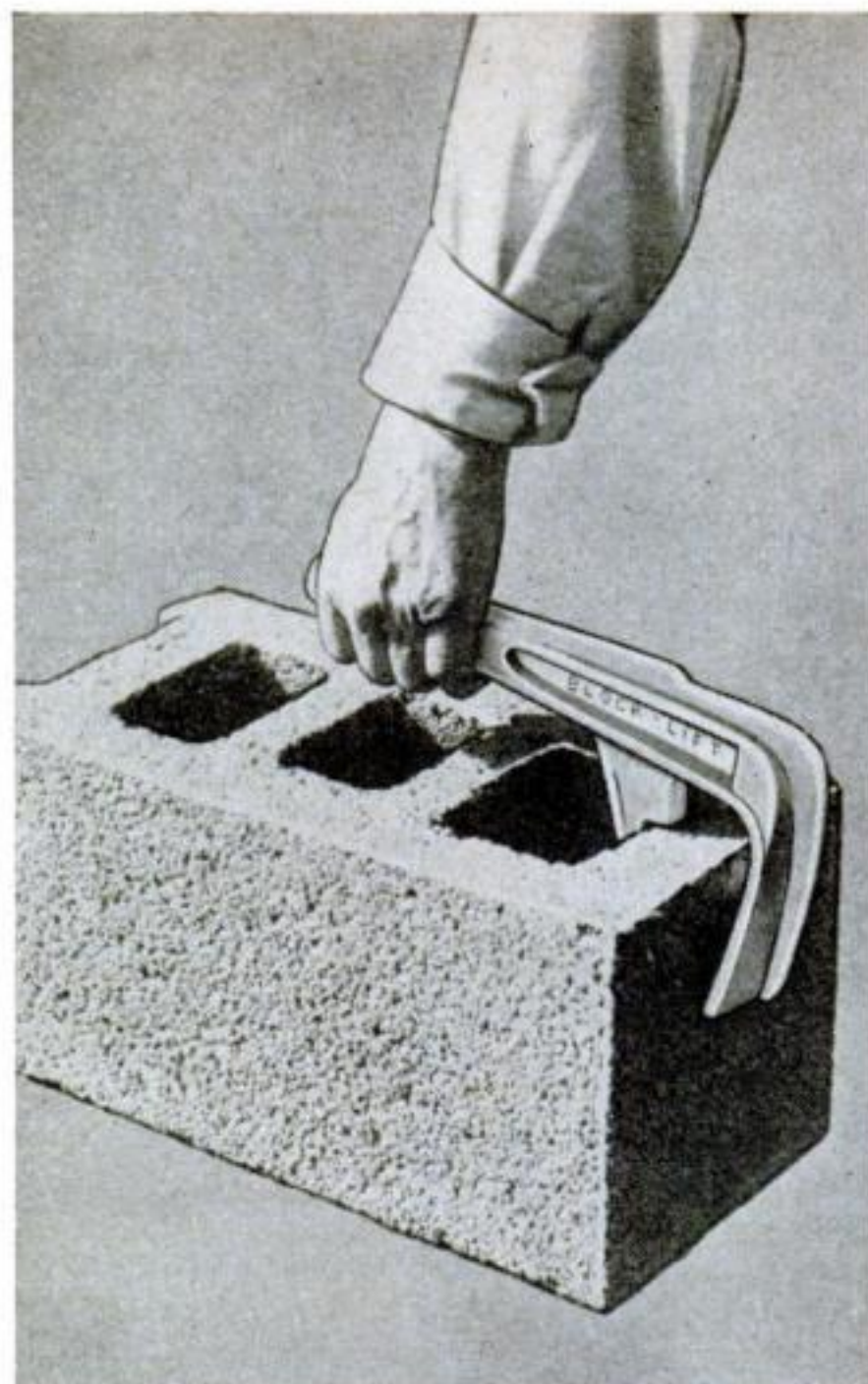
Please send Catalog No. 21 showing Foster Power Tools.

NAME _____

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CITY _____

STATE _____



New Block Lifter Speeds Construction

THIS simple tool saves both time and wear on your hands or gloves in lifting and laying building blocks. Made of cast aluminum, the Block-Lift® has no working parts. It just grips the end web of a concrete or cinder block between open jaws, as shown above, and hangs on firmly by leverage exerted by the weight of the block. The lifter weighs only 32 ounces but will hold 200 pounds without slipping.



Actual Size V-Plug

Model Builders Attention!

	V	V-2	V-3
Hex	1/2"	3/8"	5/16"
Thread	3/8"-24	1/4"-32	1/4"-32
Thread Length	7/32	7/32	5/32
Weight, Grams	8	3 1/2	2 1/2

Champion Spark Plugs for model gas engines give the same dependable performance as regular Champions. Champion Ceramic insulation—Sillment sealed. Alloy needlepoint electrodes for easy starting. One piece construction.

CHAMPION

SPARK PLUG COMPANY • TOLEDO 1, OHIO

Dependable **CHAMPION**

America's Favorite Spark Plug



When the fire department is called, fire apparatus must start instantly, accelerate quickly, and reach the scene of action with all possible speed. This requires absolutely dependable spark plugs. That's why leading producers of fire-fighting equipment specify Champion Spark Plugs. They, like other experts such as race drivers and operators of fleets of buses and trucks, know that Champions insure the utmost in performance and dependability. Champion Spark Plug Company, Toledo 1, Ohio

FOLLOW THE EXPERTS
DEMAND NEW DEPENDABLE CHAMPIONS
FOR YOUR CAR

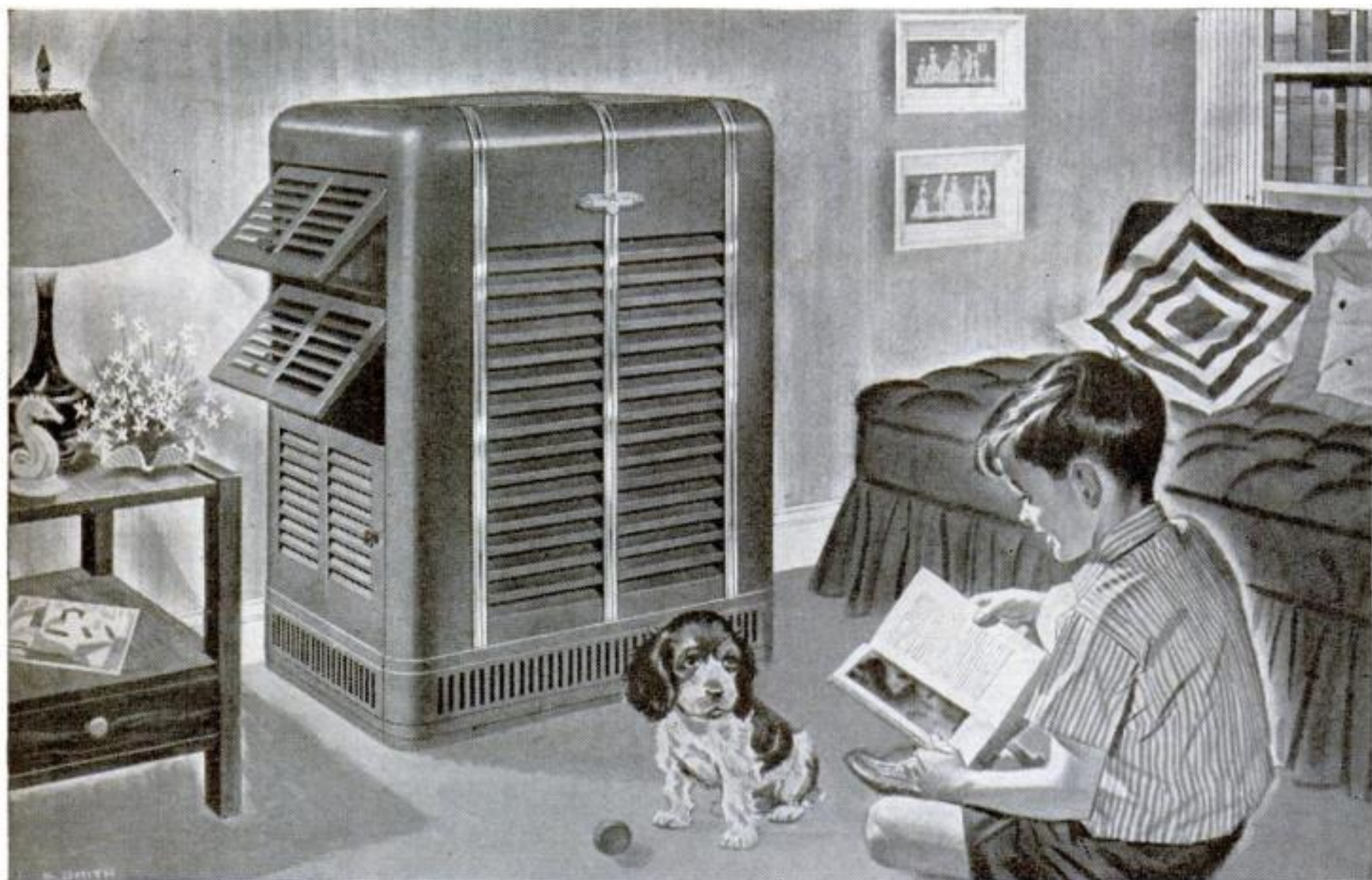


Listen to the CHAMPION ROLL CALL . . . Harry Wismer's fast sportscast every Friday night, over the ABC network

OCTOBER 1948 **251**

In addition to greater comfort, this new oil heater will give you

BIG FUEL SAVINGS THIS WINTER!



Automatic! Light it in the Fall... relax!

Your new thermostatically-controlled Perfection Heater creates comfort without supervision. No jumping to adjust fire for every weather change. Fire automatically cuts back from high or low flame to fuel saving pilot when room is warm enough . . . returns to higher fire automatically when needed.



Quiet "Floor-Flo" Blower for Floor Level Comfort!

Far corners are more easily heated and circulation improved, thanks to Perfection's specially designed blower (not just a fan). "Floor-Flo" action delivers large volume of warm air at floor level, helps keep heat where you need it. Quiet as a summer breeze.



"Multi-Heat" Burner with "Midget" Pilot Saves Money!

No other heater has Perfection's "Multi-Heat" burner with the new "Midget" Pilot. A tiny separate burner within the main burner provides a real pilot, not just a low fire. Fed fuel "by the drop", the pilot burns hours for a penny. No other burner can match its low consumption. It alternates with high or low fire to balance economy with comfort in any weather.



"Heat Extractor" Chamber Gives More Heat Per Gallon

The Perfection "Heat Extractor" catches heat that would otherwise go up the chimney. Makes it heat your home—adds to your comfort! Saves money by getting the most possible value from each gallon of fuel.

There's nothing better than the

new **PERFECTION** *Oil Heater* "More-comfort-per-gallon"

PERFECTION STOVE COMPANY, 7037-C Platt Ave., Cleveland 4, Ohio

Manufacturers of Oil Ranges and Cook Stoves, Oil Heaters, Oil Water Heaters, Oil and Gas Winter Air-Conditioning Furnaces.
ATLANTA • CLEVELAND • CHICAGO • JERSEY CITY • KANSAS CITY • OAKLAND • ST. PAUL

*For radiator
PURR-FECTION...*



Clean out rust with

DU PONT Cooling System CLEANSER

Here's a safe, sure way to clean out rust and scale — to get ready for anti-freeze. Just pour a can of DU PONT COOLING SYSTEM CLEANSER into your radiator, run the engine for 30 minutes or more, and drain. No reverse flushing needed. No fussing with the hose or flush gun. A clean cooling system paves the way for top engine efficiency.



Keep out rust with

DU PONT Acid and Rust INHIBITOR

After cleaning out the radiator, you can keep it free from rust all season by pouring in a can of DU PONT ACID AND RUST INHIBITOR. It prevents rust forming, and keeps out acid, too.



Avoid radiator leaks with

DU PONT Cooling System SEALER

You can stop leaks quickly and securely — and help to prevent radiator leaks in the future — by pouring in DU PONT COOLING SYSTEM SEALER. It will not clog the radiator or harm hose or metal parts.

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

NOW...SANDING IS FUN!



Amazing MOTO-SANDER AND POLISHER

Saves Time—Saves Elbow Grease!

Here's an inexpensive Sander and Polisher so easy to handle that a child can use it. All you do is guide it! Moto-Sander delivers 7,200 strokes a minute . . . does a magically smooth job . . . gets into places other sanders can't reach. Has only two moving parts . . . never needs oiling or adjustment. Uses 110-120 volt, 60 cycle A.C. electric current. Has 8 ft. (Underwriters' Approved) rubber cord. Furnished with 6 sheets assorted grade Garnet paper for sanding, plus $\frac{1}{8}$ " thick felt pad and sheepskin pad for wax polishing.

FINE FINISHES—FAST!

Use Moto-Sander to get satin smooth sanded finish on woodwork, stairways, doors, furniture; ideal for finish sanding of boats, painted walls, bird houses or scale models. Use it also for speedy, effortless polishing of waxed furniture, automobiles and other surfaces, simply by removing sandpaper and clamping on polishing pad. Moto-Sander is the lightest, most practical electric sander on the market, and is patented.

MONEY-BACK GUARANTEE

See Dremel Moto-Sander at your dealer's. If he cannot supply you, use coupon below to order on 5-day trial, money-back guarantee. Moto-Sander will be sent complete and postpaid for \$14.85 (check or money order in full). Or, send only \$2 with order and pay postman balance plus postage upon C.O.D. delivery. Remember, **YOUR MONEY BACK** if not delighted after 5 days' trial.

DREMEL MFG. CO.

Dept. SP128-K Racine, Wis.
Manufacturers of the famous
MOTO-TOOL and **MOTO-SAW**



EASY FOR
AWKWARD PLACES



SANDS FLAT
SURFACES EVENLY



GETS INTO
TIGHT CORNERS



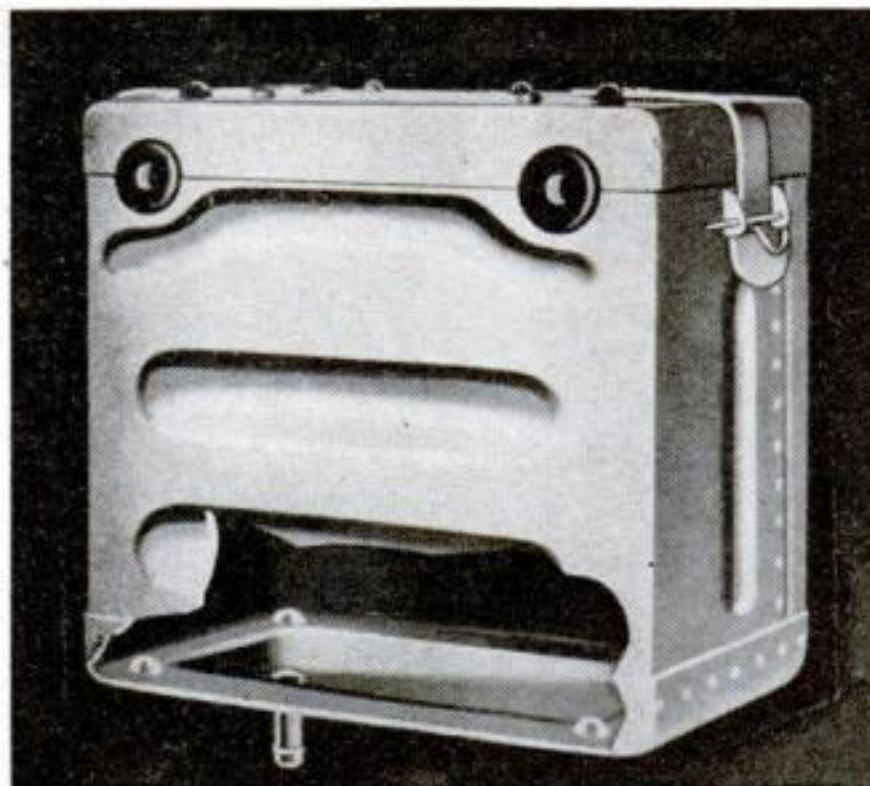
ROUNDS CORNERS
LIKE MAGIC



GREAT FOR
AUTO POLISHING

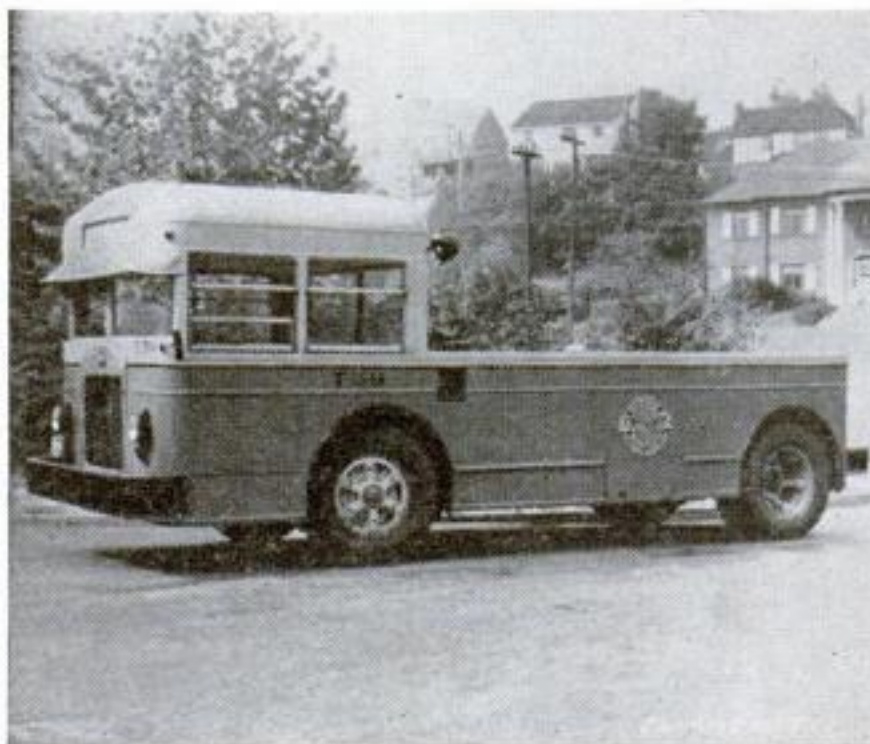
**Only
\$14.85**

POSTPAID



Box Catches Acid

THIS aluminum battery case for airplanes lets a pilot do acrobatics in the sky without worrying about spilling acid. Developed by Reading Batteries, Inc., of Reading, Pa., to hold its Rebat S 24[®] aircraft battery, the 22-oz. box has a trough in the bottom to catch any acid that may spill and a tube for draining it off. Rubber-faced blocks inside the cover hold the battery firmly against pads on the bottom and prevent shorting between the terminals. Ribbing on all sides reinforces the box and provides air space for ventilation.



Bus Becomes Tow Car

AFTER 14 years of carrying passengers, this old Mack bus has been converted into a service truck. Now the Cincinnati Street Railway Co. uses it as a mobile repair shop and tow car. The driver and a crew of mechanics ride in front, protected from the weather, and tools are stowed in the back.

IF YOUR DEALER CANNOT SUPPLY YOU USE THIS COUPON TO ORDER

DREMEL MFG. CO. • DEPT. SP128-K • RACINE, WIS.

- ☐ Enclosed find \$14.85 (Check or money order in full). Ship Moto-Sander at once Postpaid.
- ☐ Enclosed find \$2.00 as part payment on Moto-Sander. I will pay postman balance plus postage upon C.O.D. delivery.
- ☐ Please send Free Catalog of Dremel Tools and Equipment.

NAME.....

ADDRESS.....

CITY.....ZONE.....STATE.....



Moto-Tool

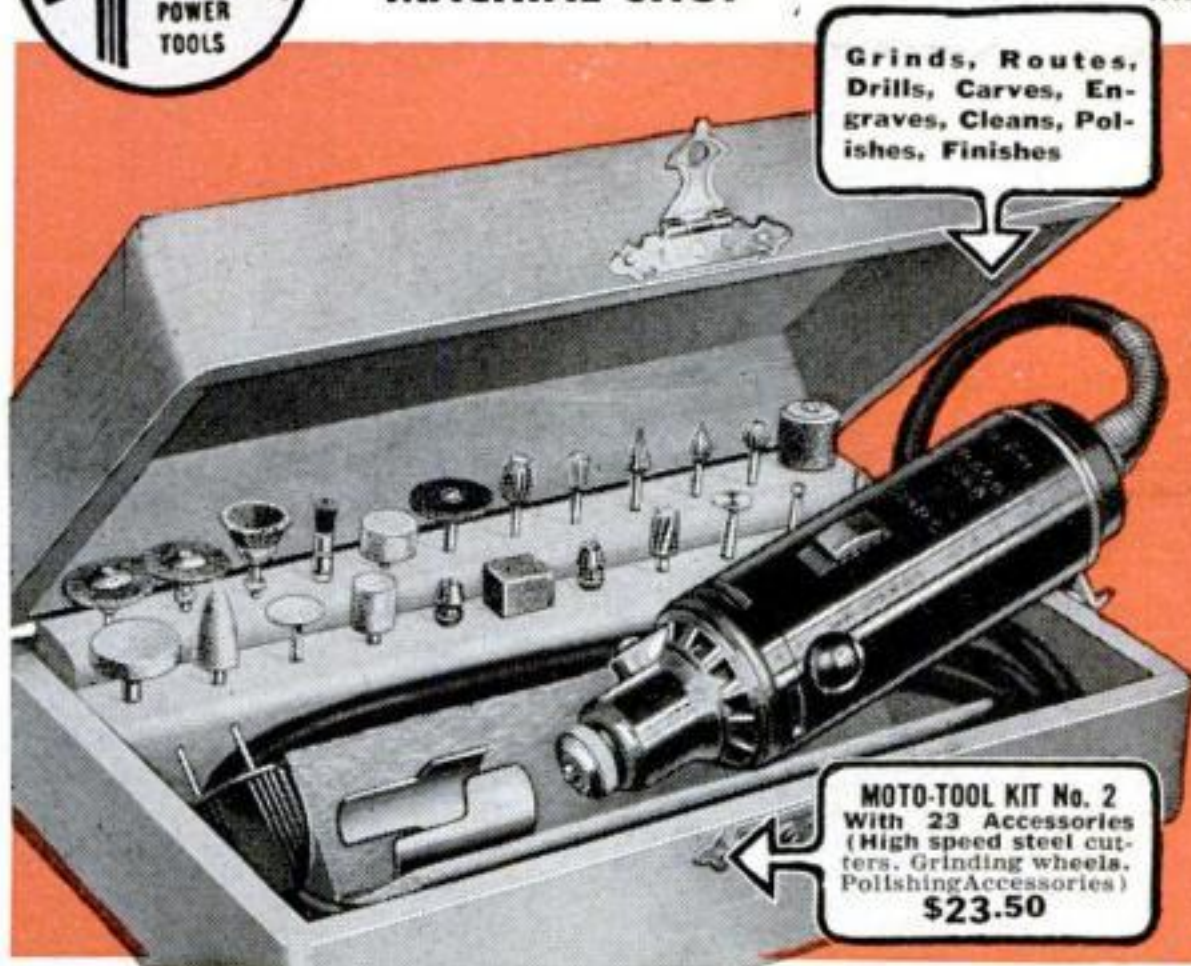
THE "POCKET-SIZE
MACHINE SHOP"



Great For
Hobbyists



For Sharpening
Tools



Grinds, Routes,
Drills, Carves, En-
graves, Cleans, Pol-
ishes, Finishes

MOTO-TOOL KIT No. 2
With 23 Accessories
(High speed steel cut-
ters, Grinding wheels,
Polishing Accessories)
\$23.50



APPROX.
27,000 R.P.M.



Saves Time
And Labor



Indispensable
To Machinists

A SHOP TESTED TOOL

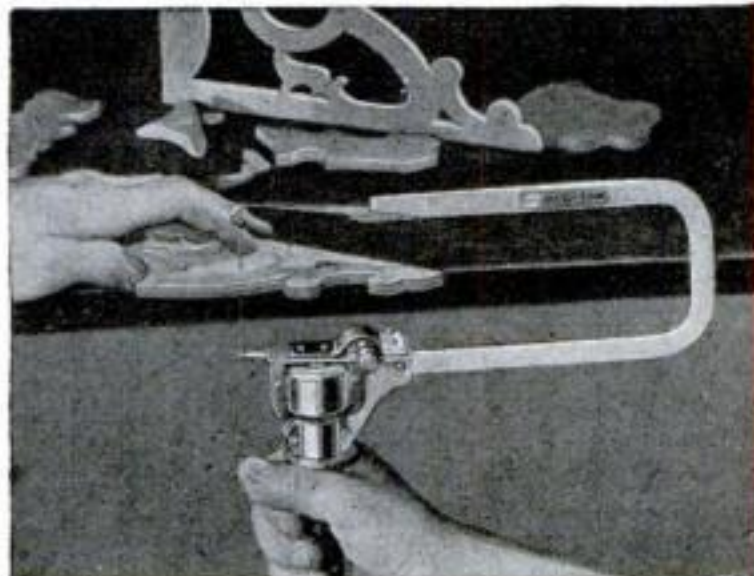
Moto-Tool is backed by over 12 years of industrial use . . . packs years of extra pleasure . . . yet, due to increased production, pre-war prices still prevail!

Look for These Moto-Tool Features

Oil-less, sealed bearings • Patented automatic chuck lock pin • Oversize armature shaft; hardened, ground, polished • Shockproof, bakelite housing • Dust filtered air cooling system • Dynamically balanced for vibrationless operation • Exclusive hanger hook • Weight only 13 ozs.

MOTO-SAW

THE AMAZING ELECTRIC SCROLL SAW



This electric coping saw works like magic! Easily cuts intricate scroll designs in medium-hard wood up to $\frac{3}{4}$ " thick. Runs 7,200 strokes a minute . . . just guide it! Has only two moving parts . . . never needs oiling. Operates on 110-120 volt, 50 or 60 cycle A.C. electric current. As safe as a handsaw . . . thousands of satisfied users. **\$5.85** Comes complete with 3 saw blades, at only . . .

New DRILL PRESS

ONLY **\$9.95**

(Less Moto-Tool)

Only Dremel offers you a portable, precision drill press at such an amazingly low price. Just the thing for creating costume jewelry, model making, wood carving, routing, etc. Utilizes Model No. 2 Moto-Tool, which can be raised or lowered, swung in any direction, or quickly removed for off-hand use. Drill Press stands 12" high. Base is $6\frac{3}{4}$ " x 4". Weighs approximately $3\frac{1}{2}$ pounds.



MONEY-BACK GUARANTEE

Buy Dremel Tools from your dealer. If he cannot supply you, use coupon below to order desired items on 5-day trial, money-back guarantee. Items checked will be sent complete and postpaid for check or money order in full. Or, send only \$2 with order, and pay postman balance plus postage upon C.O.D. delivery. Remember, YOUR MONEY BACK if not delighted after 5 days' trial.

DREMEL MFG. CO.
DEPT. T128-K • RACINE, WIS.

Here's BIG VALUE!



Model No. 1
MOTO-TOOL KIT
ONLY **\$17.50**

This highly popular Kit contains lighter Model No. 1 Moto-Tool and 34 practical accessories in attractive, lacquer-finish wood box. It's the biggest bargain in the field.

USE THIS COUPON TO ORDER

IF YOUR DEALER CANNOT SUPPLY YOU WITH DREMEL TOOLS

DREMEL MFG. CO., Dept. T128-K • RACINE, WISCONSIN

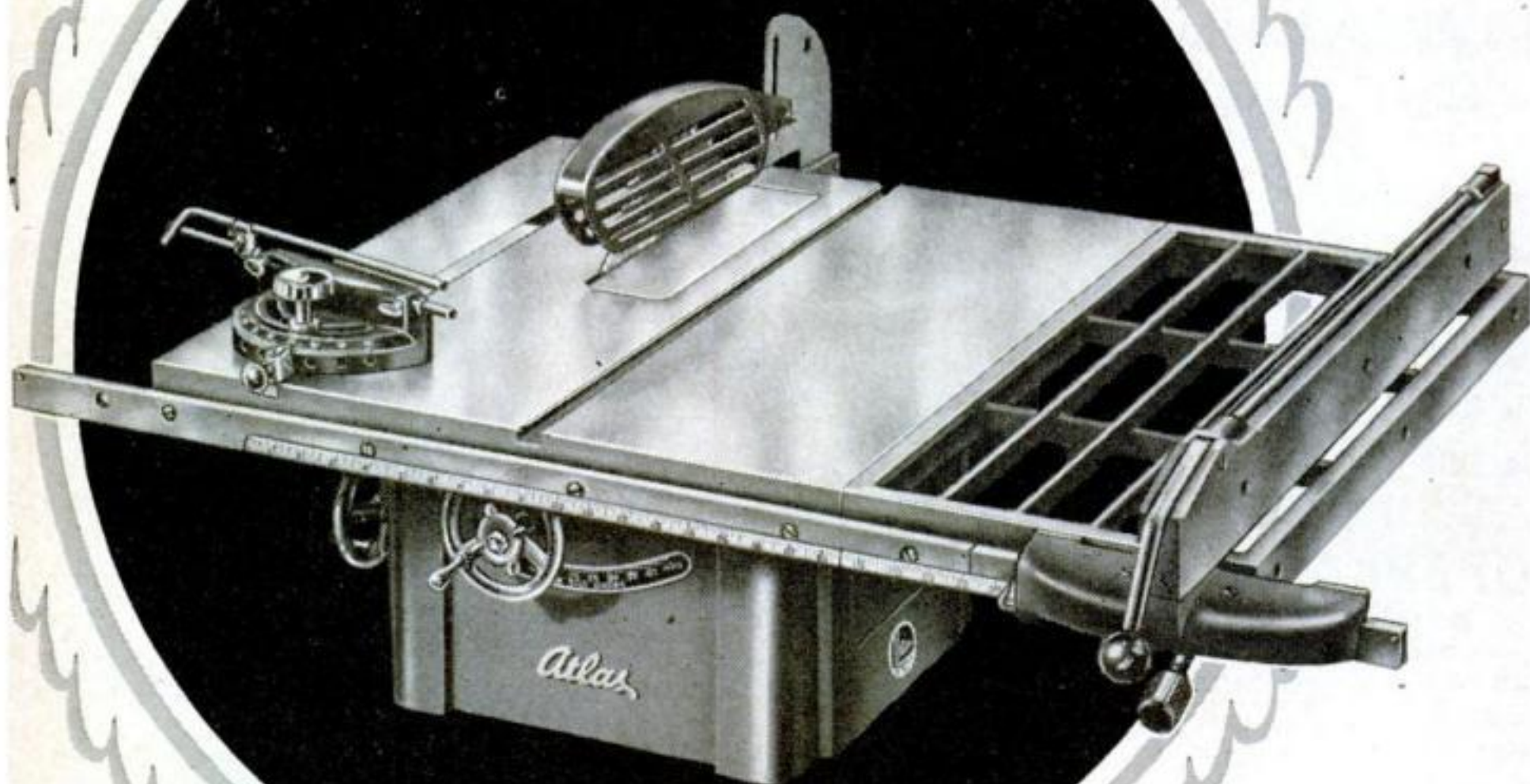
- ☐ Enclosed find \$..... (Check or money order in full). Ship items checked below at once Postpaid.
- ☐ Enclosed find \$2.00 as part payment on items checked. I will pay postman balance plus postage upon C.O.D. delivery.
- ☐ Moto-Tool Kit No. 2, \$23.50. ☐ Moto-Saw, with 3 blades, \$5.85.
- ☐ Moto-Tool Kit No. 1, \$17.50. ☐dozen blades (60c per doz.)
- ☐ Drill Press (Less Moto-Tool), \$9.95. ☐ Free catalog of Dremel Tools & Equip.

NAME..... ADDRESS.....

CITY..... ZONE..... STATE.....

Atlas

10" Tilt/Arbor SAWS



Created for the Real Craftsmen of America

Every home shop owner looks forward to the day when *his* shop is equipped as fine as any in the land. It's more than personal pride in owning the finest. As skill increases most men want and need unlimited capacity in the size of projects they can handle — for greater satisfaction, greater returns from their hobby.

Atlas engineers have reached into the future for such tools! They have designed fast, accurate, versatile wood-working tools matching the precision of Atlas metalworking equipment. Among the first is the 10" Tilt/Arbor bench saw shown here. Others will soon be arriving at your Atlas dealer's. Visit him, and see how economically your "shop of the future" can be yours today!



MATCHED PRECISION TOOLS

FEATURES

● BIG PRECISION-GROUND TABLES

No. 3060 (no extensions) is 25" deep, 22" wide. Gives you 12 $\frac{3}{4}$ " surface ahead of blade — 13 $\frac{3}{4}$ " to right of blade.

No. 3070 (shown at left) is 25" deep, 33 $\frac{3}{4}$ " wide. 12 $\frac{3}{4}$ " surface ahead of blade — 25 $\frac{1}{2}$ " right of blade.

No. 3080 (two extensions) is 25" deep, 45 $\frac{1}{2}$ " wide. 12 $\frac{3}{4}$ " surface ahead — 25 $\frac{1}{2}$ " right — 19 $\frac{3}{4}$ " left of blade.

● CUTS TO 3 $\frac{1}{4}$ " DEEP

● BLADE TILTS 45° — TABLE STAYS FLAT

● QUICK-POSITIONING RIP FENCE

● VERNIER CONTROL FOR FINE ADJUSTMENT

● SKF PRECISION BALL BEARINGS

● DUAL V-BELT DRIVE

OPERATION HIGHLIGHTS

You get some idea of the capacity of this Atlas 10" saw when you realize that with one extension you can rip to the center of plywood and building board panels 4 feet wide. And the work slides smoothly on the *grey-iron precision-ground* surface of table and extension.

The fence with its lever control is a most unusual new development. It locks securely at both ends — unlocks instantly and *lifts* off for positioning on either side of blade. Vernier control gives you fine adjustment.

The other controls — saw height and blade angle — are the smoothest ever...no binding...positive locks.



New FREE Catalog

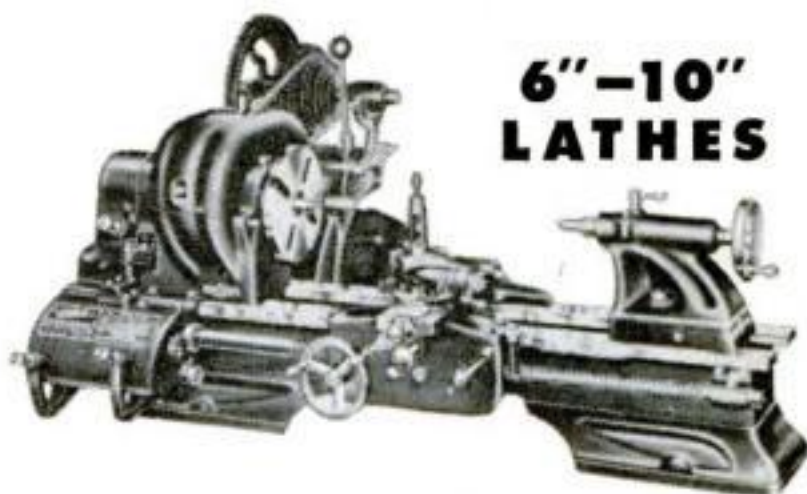
Get *all* the details about all three models. Send a postcard for this new illustrated catalog.

ATLAS PRESS COMPANY

1055 N. Pitcher St. • Kalamazoo, Mich.

FOR METALWORKING AND WOODWORKING

Atlas INDUSTRIAL QUALITY TOOLS TO WIDEN YOUR SHOP'S WORK RANGE



6"-10" LATHES

For metal machining Atlas 6" and 10" lathes are today's outstanding values in versatility, lasting accuracy, and low price. Ask your dealer or send for new catalog.

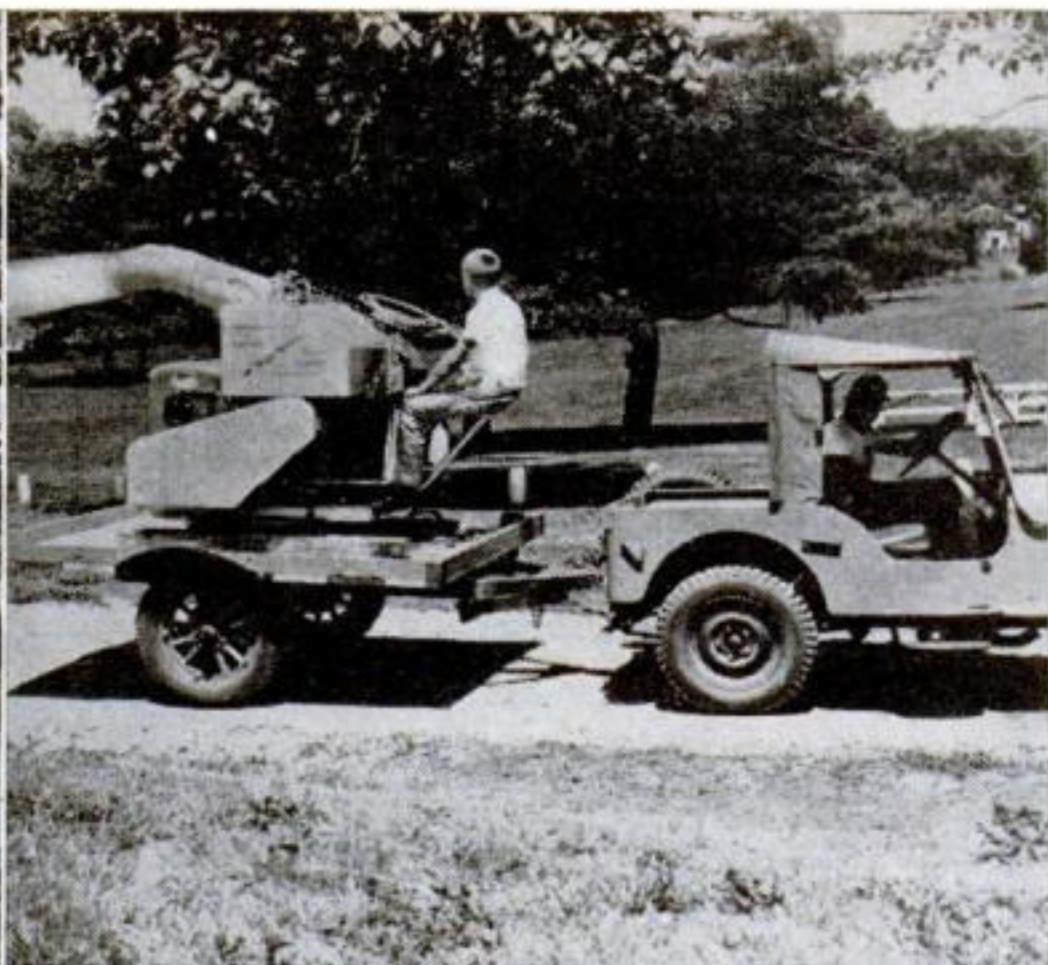
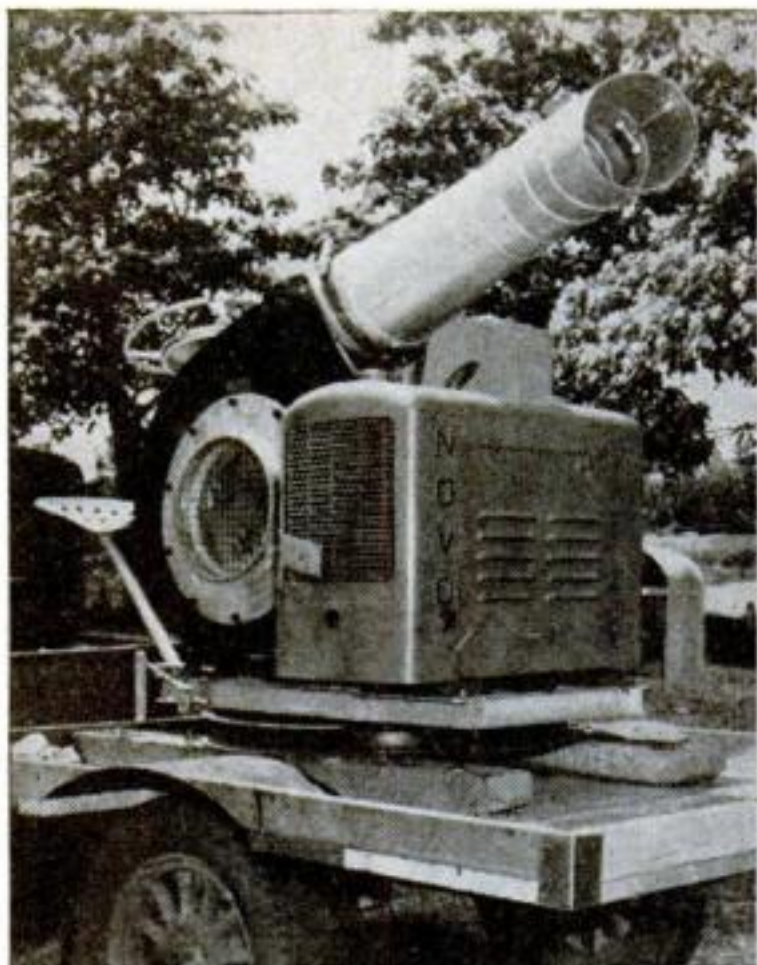
DRILL PRESSES

12 $\frac{3}{4}$ " and 15" bench models, and 15" floor type. "Floating-Drive" spindles assure smooth accuracy in drilling and tapping metal and plastics. Attachments to handle wood routing, sanding, mortising, inlaying, and shaping.



10" FLOOR SAW

This is the de luxe saw — a standard table of 27 $\frac{1}{2}$ " x 27 $\frac{1}{2}$ " that can be increased with extensions to 27 $\frac{1}{2}$ " x 59 $\frac{1}{2}$ ". Gives you all the operating features of the 10" bench saws plus its own stand and extra capacity.



Sprayer Fights Bugs

THIS truck-towed trailer, resembling an anti-aircraft gun, is a mobile weapon in man's war against harmful insects. Liquid insecticide, injected into a stream of air from a powerful blower, sprays from its nozzle as a fine mist. Mounted like a turret, the unit

can be turned in a complete circle to blanket a wide swath. The machine is made by the Lawrence Aero-Mist Sprayer Co., of Greenfield, Mass. It is used against insect enemies of crops and trees, to wipe out flies and mosquitoes in resort areas, and to forestall possible epidemics in regions contaminated by floods.

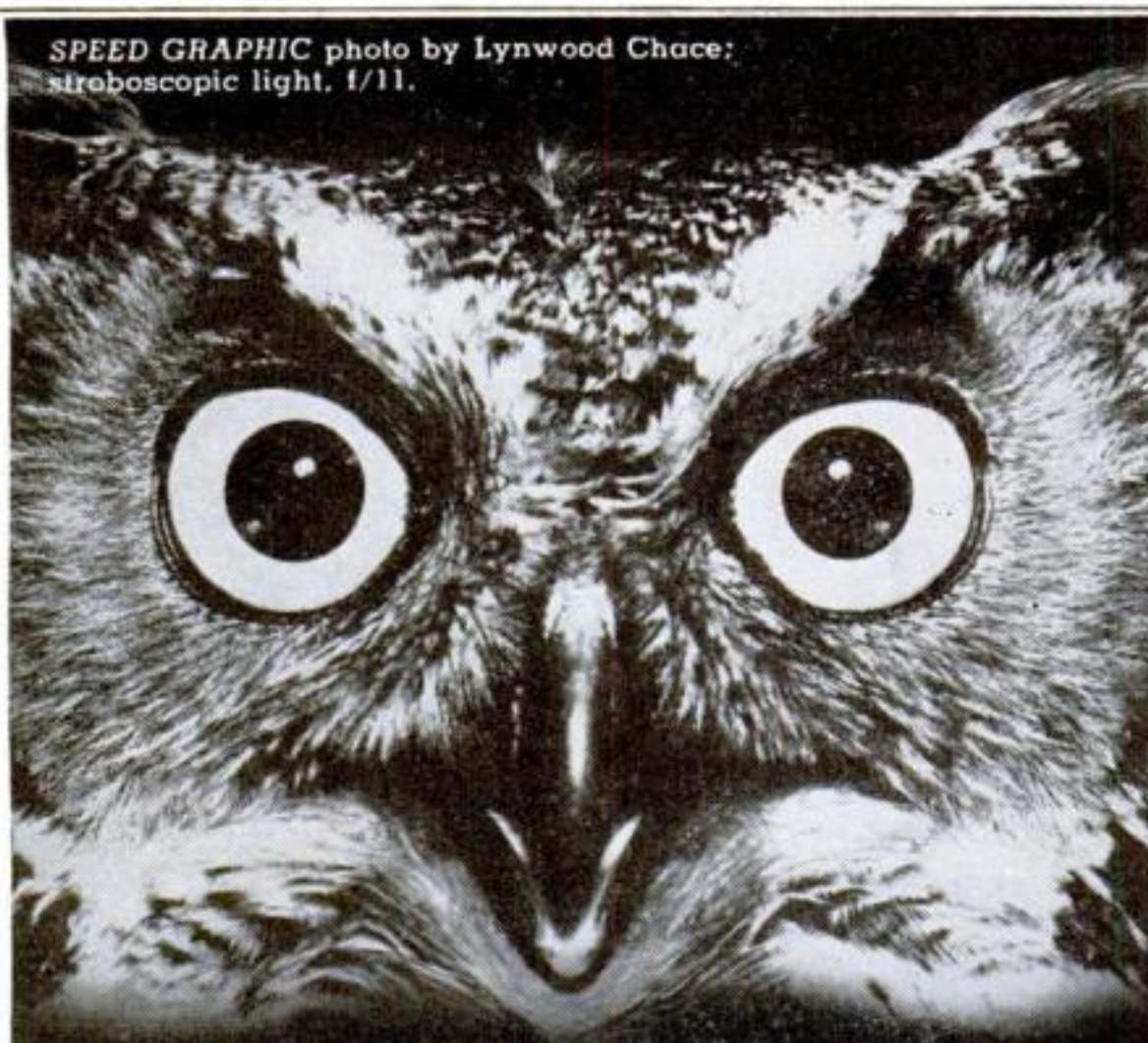
If it's a Prize-Winner you're after... **GET A GRAFLEX!**

If you're interested in profiting from one of the most wonderful of hobbies — photography — let your local dealer show you one of the great cameras in the Graflex line. From the Pacemaker **SPEED GRAPHIC** to the RB Series B Graflex, you can choose the one camera that suits your particular needs.

Be like the thousands of non-professional and professional photographers who depend on Graflex cameras to get those outstanding shots that win prizes or are sold to the hundreds of outlets that demand great pictures. Enter the big 1948 Graflex Photo Contest — \$5000.00 in prizes! See your local Graflex dealer now for official rules and entry forms.

Graflex, Inc., Rochester 8, New York

SPEED GRAPHIC photo by Lynwood Chace:
stroboscopic light, 1/11.

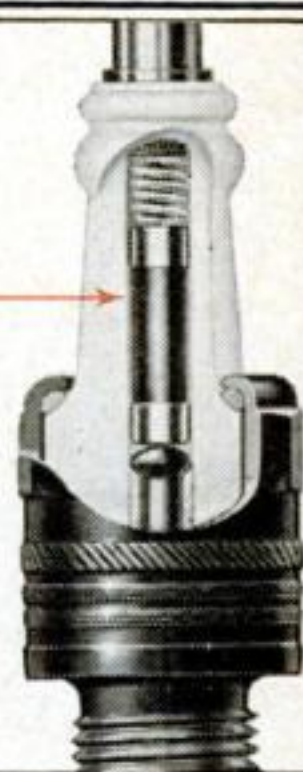


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NEW AUTO-LITE *Resistor* SPARK PLUG

NEW
BUILT-IN
"RESISTOR"
AIDS
PERFORMANCE



New Auto-Lite Spark Plug Has Built-in "Resistor" That Helps Deliver Smoother Idling, Better Radio Reception—Gives Improved Economy and Longer Electrode Life



Gives smoother engine idling

—because of the wider initial spark gap setting possible on the "Resistor" plugs. This assists in burning leaner mixtures, and reduces misfiring at idling and throughout the speed range.

Improves radio reception

—by suppressing spark plug interference with radio, radio-telephone, radar and television reception. (Under 35 mv/m from 540 kc. to 150 mc. at 50 ft.)

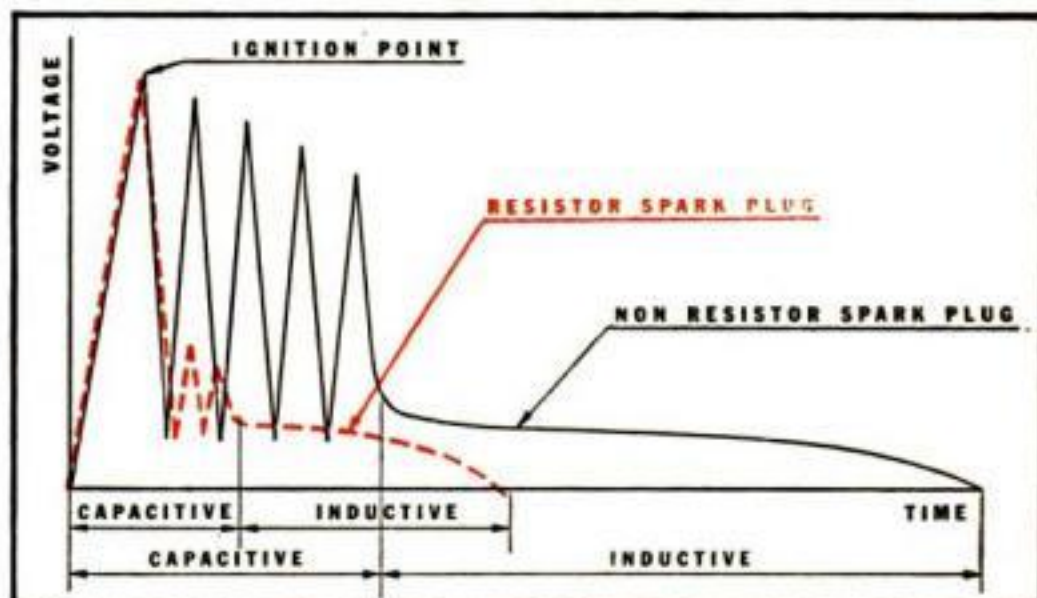


Reduces electrode gap growth

—by increasing electrode life up to 200% and more . . . due to the virtual elimination of the inductive component in the spark discharge.

. . .

AUTO-LITE Ignition Engineers, working with leading automotive manufacturers, have developed the new Auto-Lite "Resistor" Spark Plug with this built-in resistor for improved operation and economy. Regular type Auto-Lite Spark Plugs (patented U.S.A.) will continue to be manufactured.



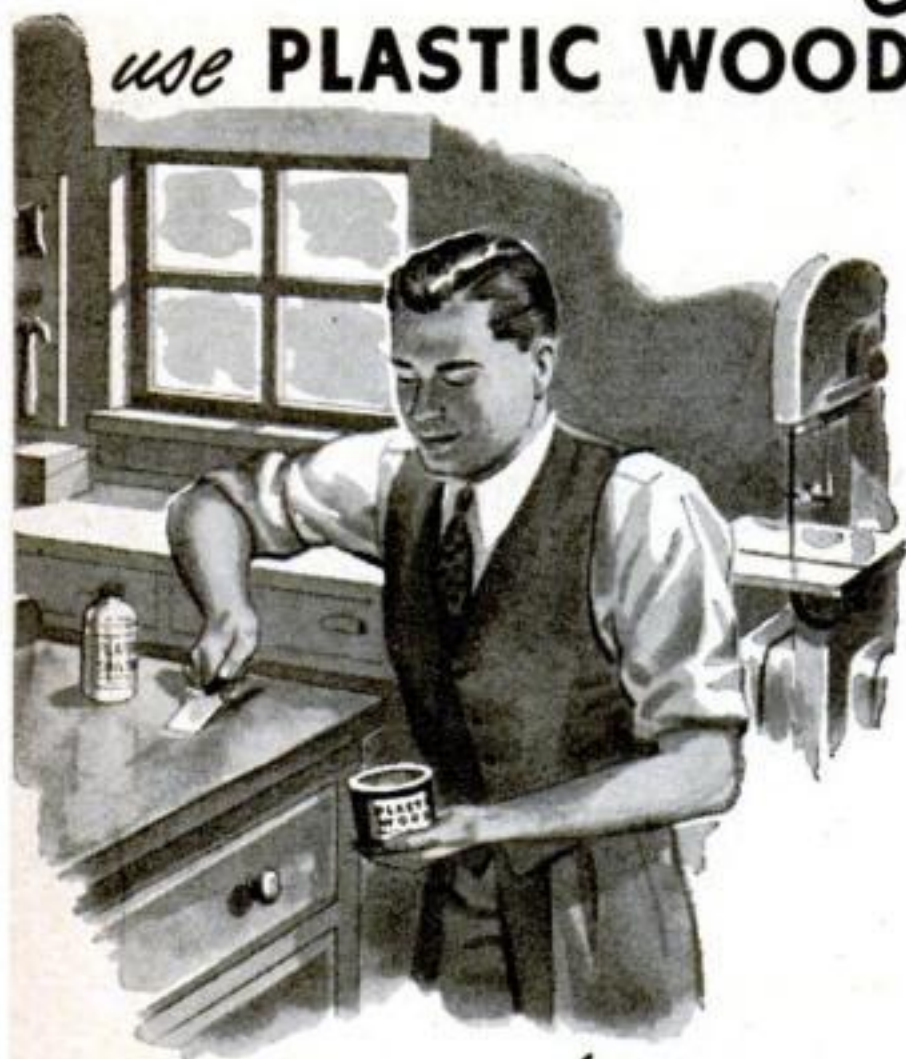
All spark plugs, including the new Auto-Lite Resistor Plug, ignite the fuel on the first peak of the capacitive component. However, the Resistor Plug dampens the remaining peaks so that radio, radar, and television interference is held to an acceptable level. Also, the Resistor virtually eliminates the inductive component that serves only to burn away the electrodes on ordinary plugs. The gap life is thus increased, making possible wider initial gap settings.

THE ELECTRIC AUTO-LITE COMPANY

Toronto, Ontario

Toledo 1, Ohio

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If you'd like a satiny smooth, professional finish on your next cabinet job—use Plastic Wood! It's an ideal filler for cracks or rough grains, dries tight and hard, sands to a swell finish and takes paint, lacquer or varnish perfectly. Here's an extra hint—knot holes or gouges just disappear when this handiest filler is used! *Handles like putty—hardens into wood!*

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FOR REPAIRING ...

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- Broken furniture

- You'll want Plastic Wood SOLVENT, too. Get both at one time. It is made especially to control the consistency of Plastic Wood ... useful also in removing dried Plastic Wood from tools and fingers.

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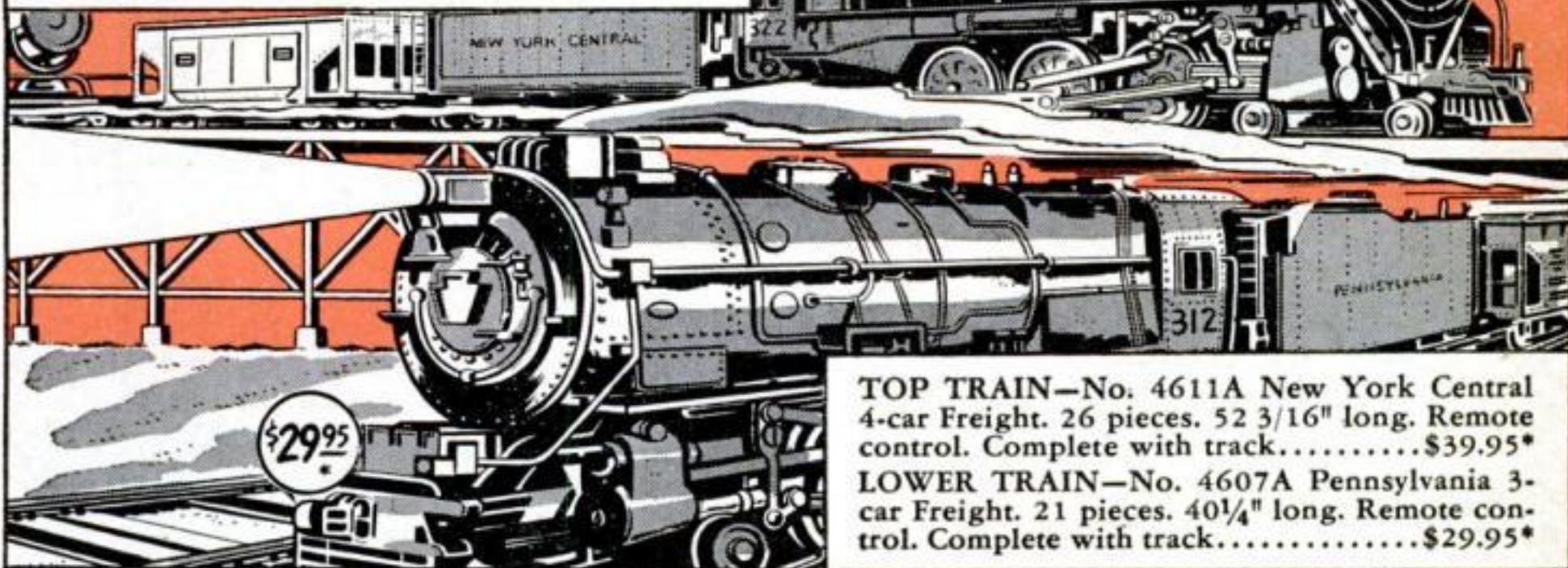
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COLOSSAL TRAIN BOOK. 32 big pages with color illustrations of American Flyer trains, automatic log loader, coal loader and other sensational equipment. Mail coupon with 10¢. Gilbert Hall of Science
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1 INCH BETWEEN WASHER AND COLLAR
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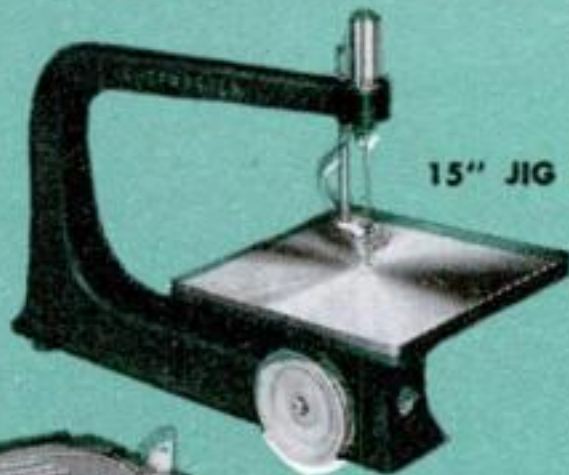
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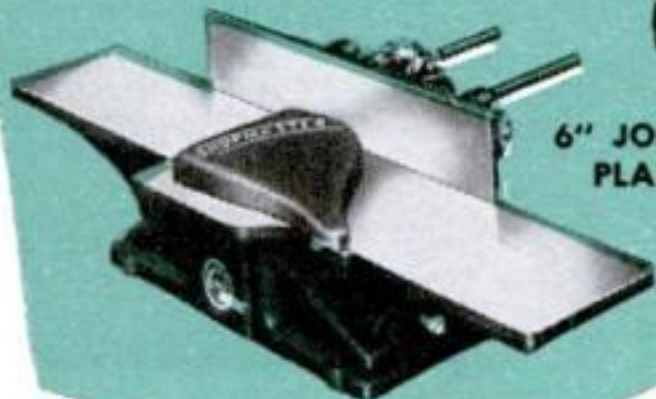
SABER SAW



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6" JOINTER-PLANER



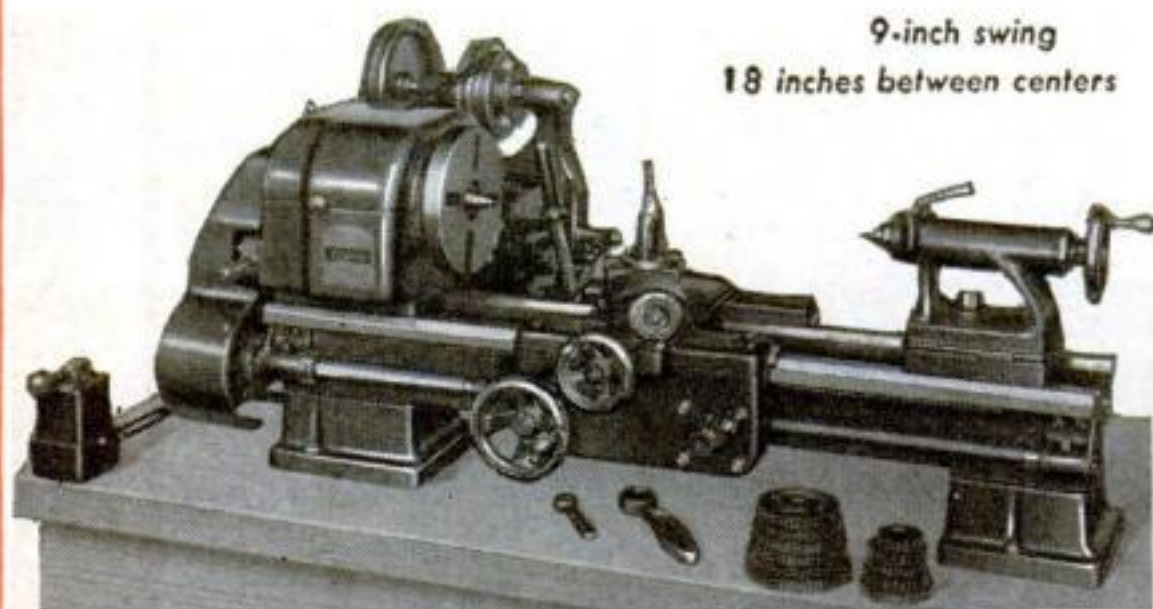
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**Plus Logan speed,
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18 inches between centers

• This lathe will produce precision results on any job you give it, and it retains its accuracy through years of use. Bed ways precision ground to within .0005" of parallelism. Ball bearing spindle needs no bearing adjustment from 30 to 1450 rpm. In brief, it is a LOGAN Lathe built in a compact 9-inch size. See it at your Logan dealer's, or write for information.

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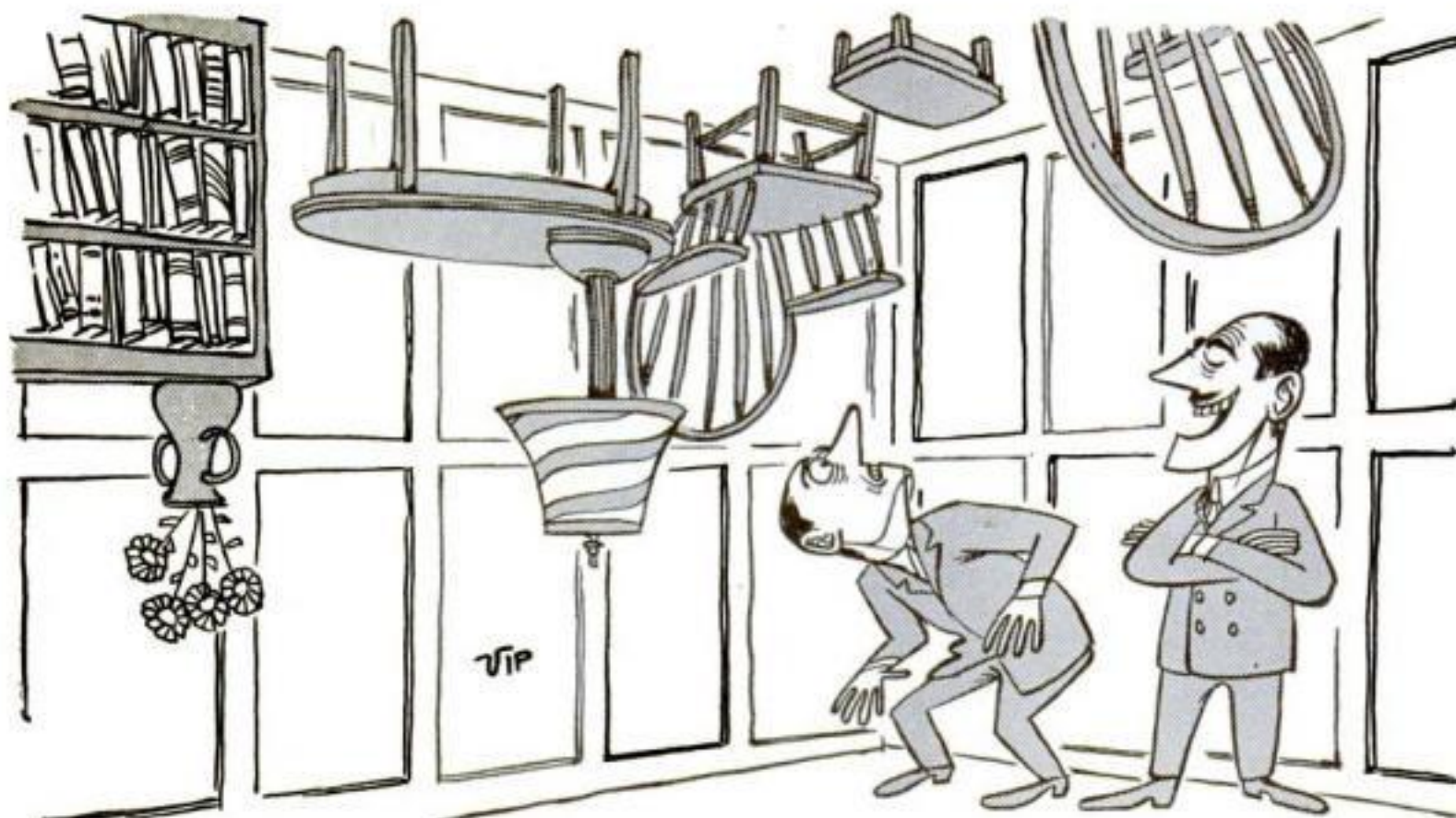
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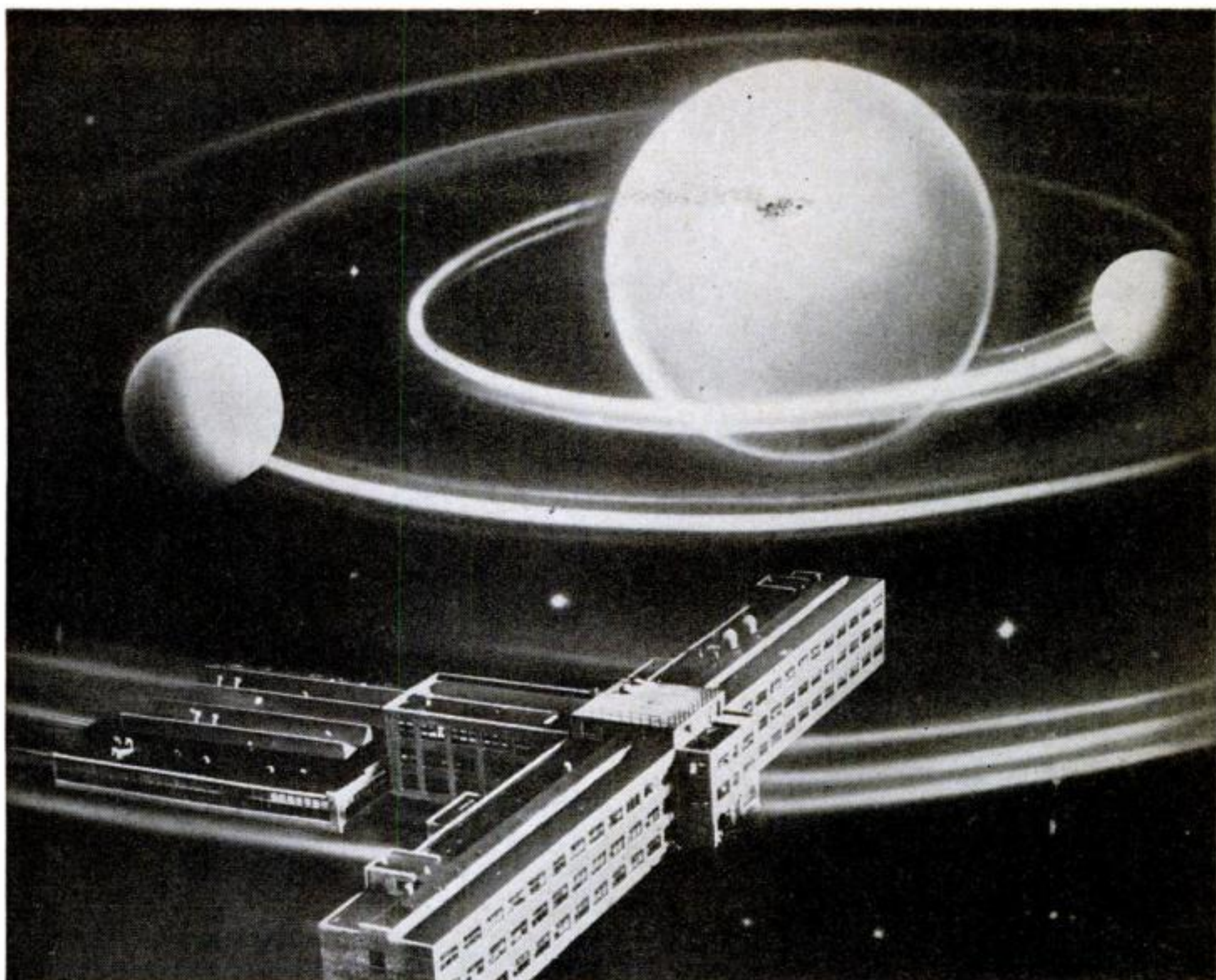
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"Sunspot" research, by RCA engineers, helps radio communications to dodge interference from magnetic storms. RCA Laboratories is a center of radio and electronic research.

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What can be done about it? Research, during which RCA scientists and engineers "worked" by instrument on the face of the sun—93,000,000 miles away—offers an answer.

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RCA scientists took a new tack. They noted that interference was most intense when sunspots were in a certain "critical area." *Location and activity* were more important than *size*.

Using this knowledge, RCA communications engineers now accurately forecast the beginning and end of magnetic storms. . . . They have established a daily magnetic storm forecasting service which is distributed like weather reports throughout the world. As

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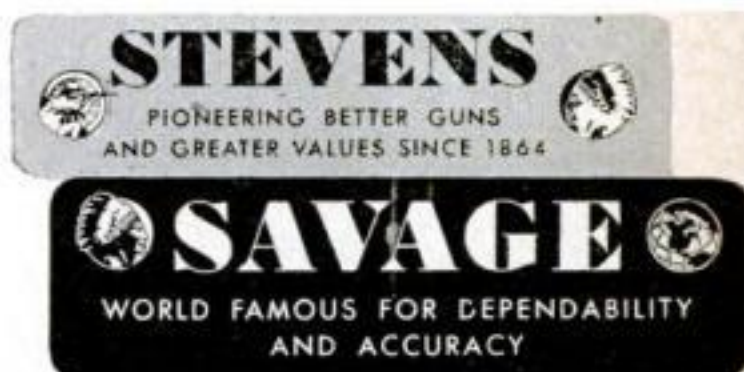
No 91—4", 6", 8", 10", 12"
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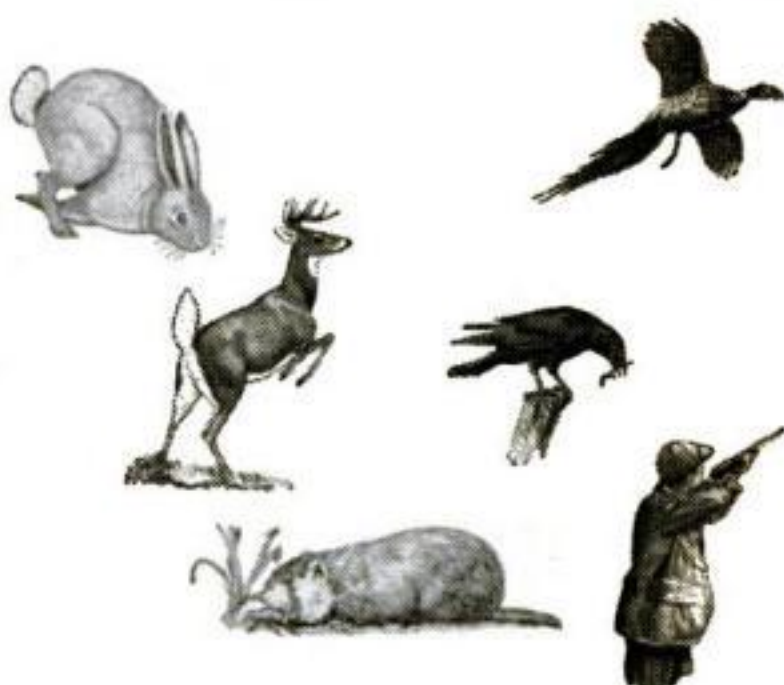
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**NO. 498
QUICK CLAMP**



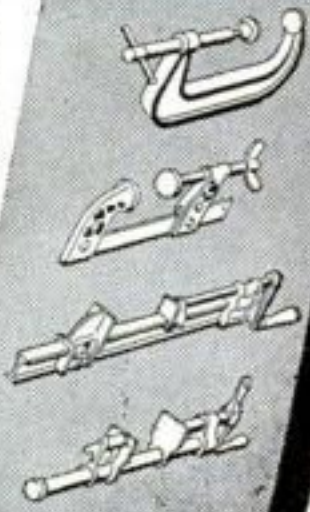
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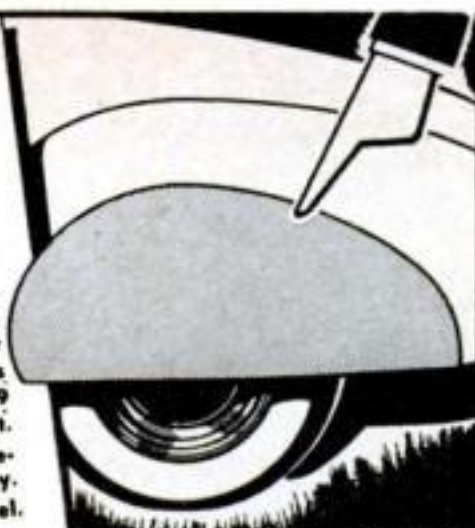
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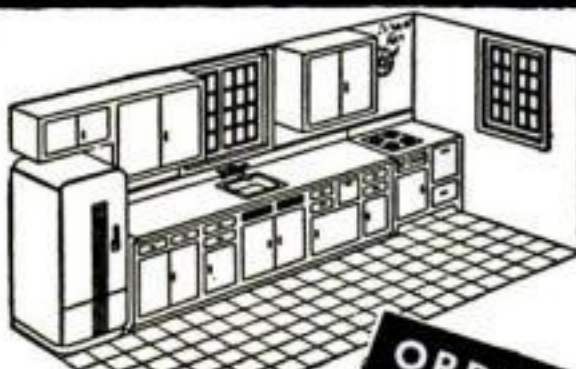
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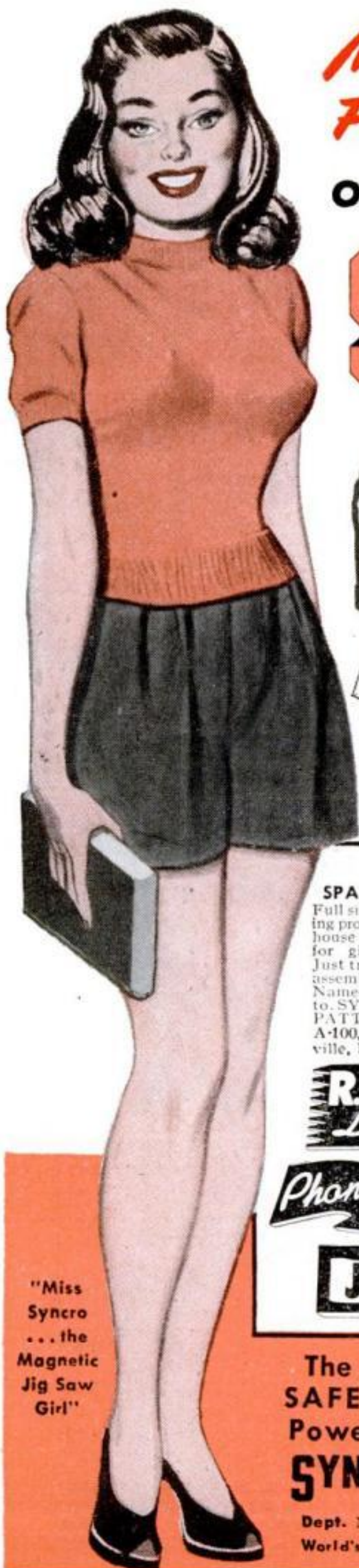
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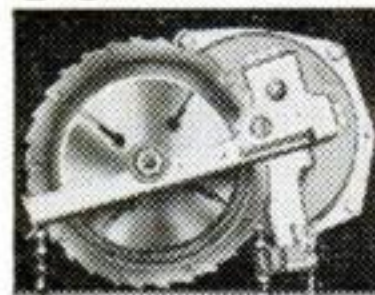
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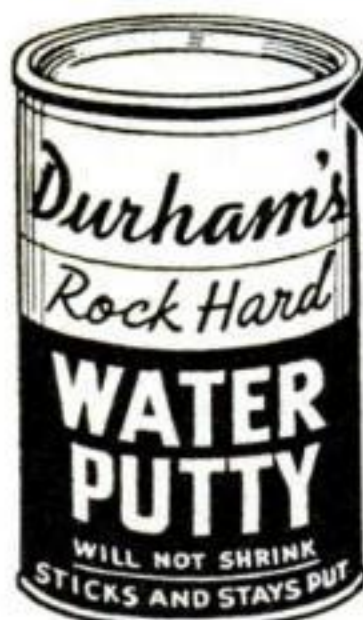
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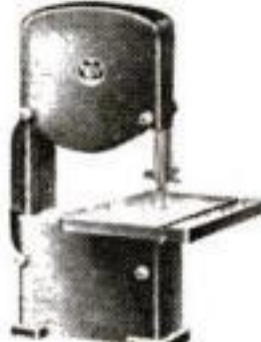
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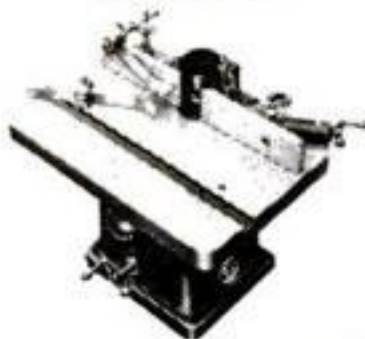
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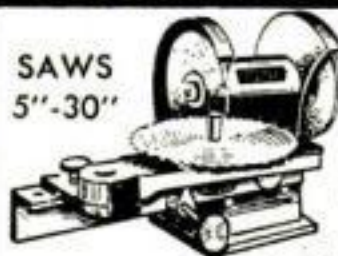
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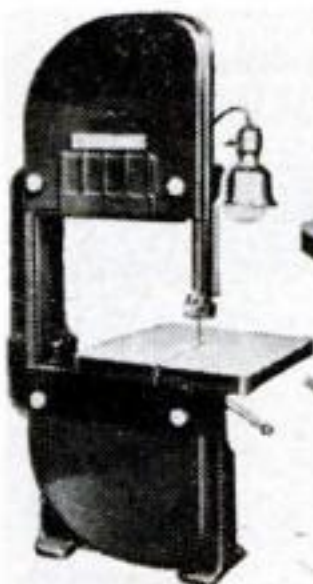
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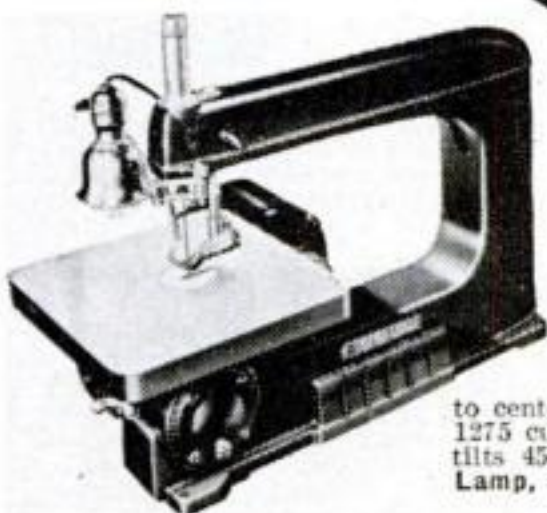
Homecraft Band Saw, No. 28-110 — Has 6½" capacity under guide and throat capacity of 9½". Fully-adjustable blade guides. Table tilts 45°. **\$3995**
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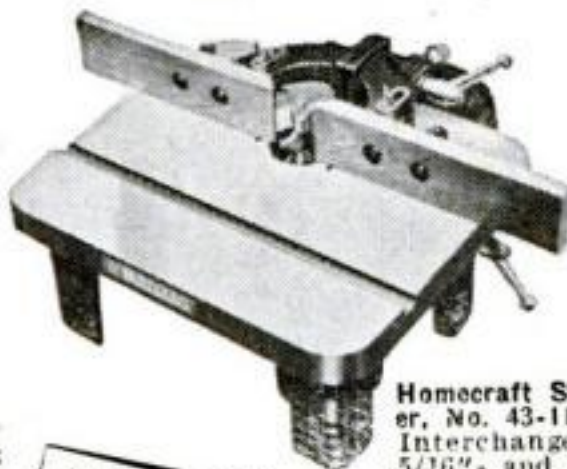
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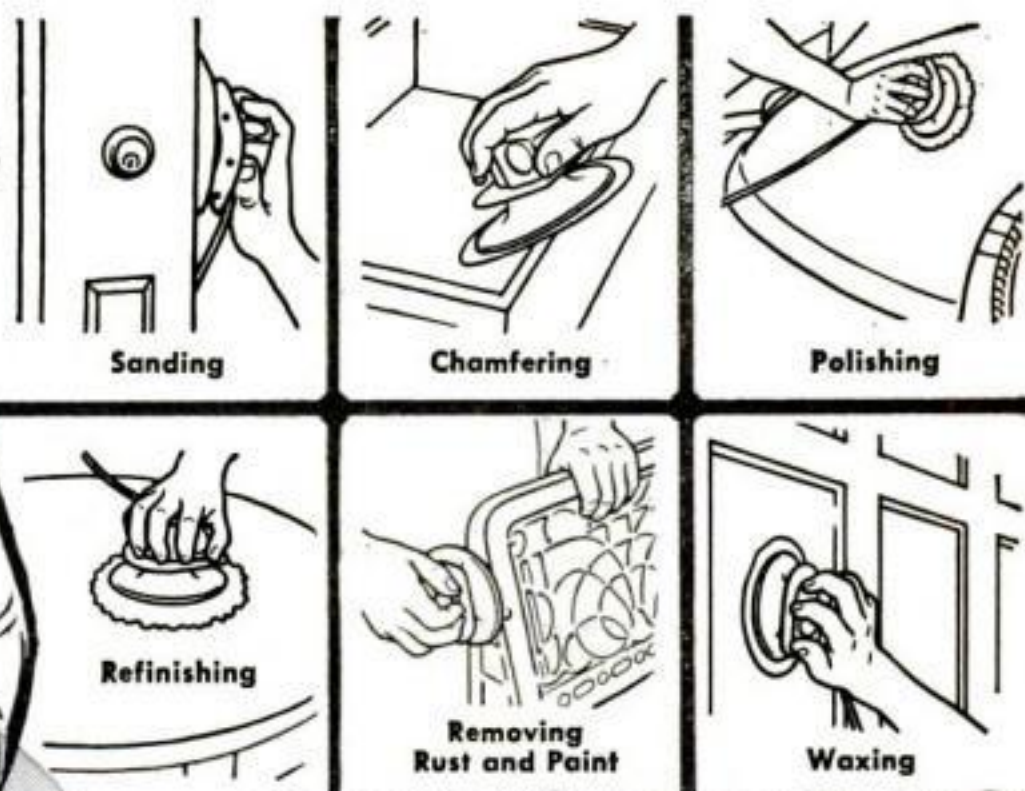
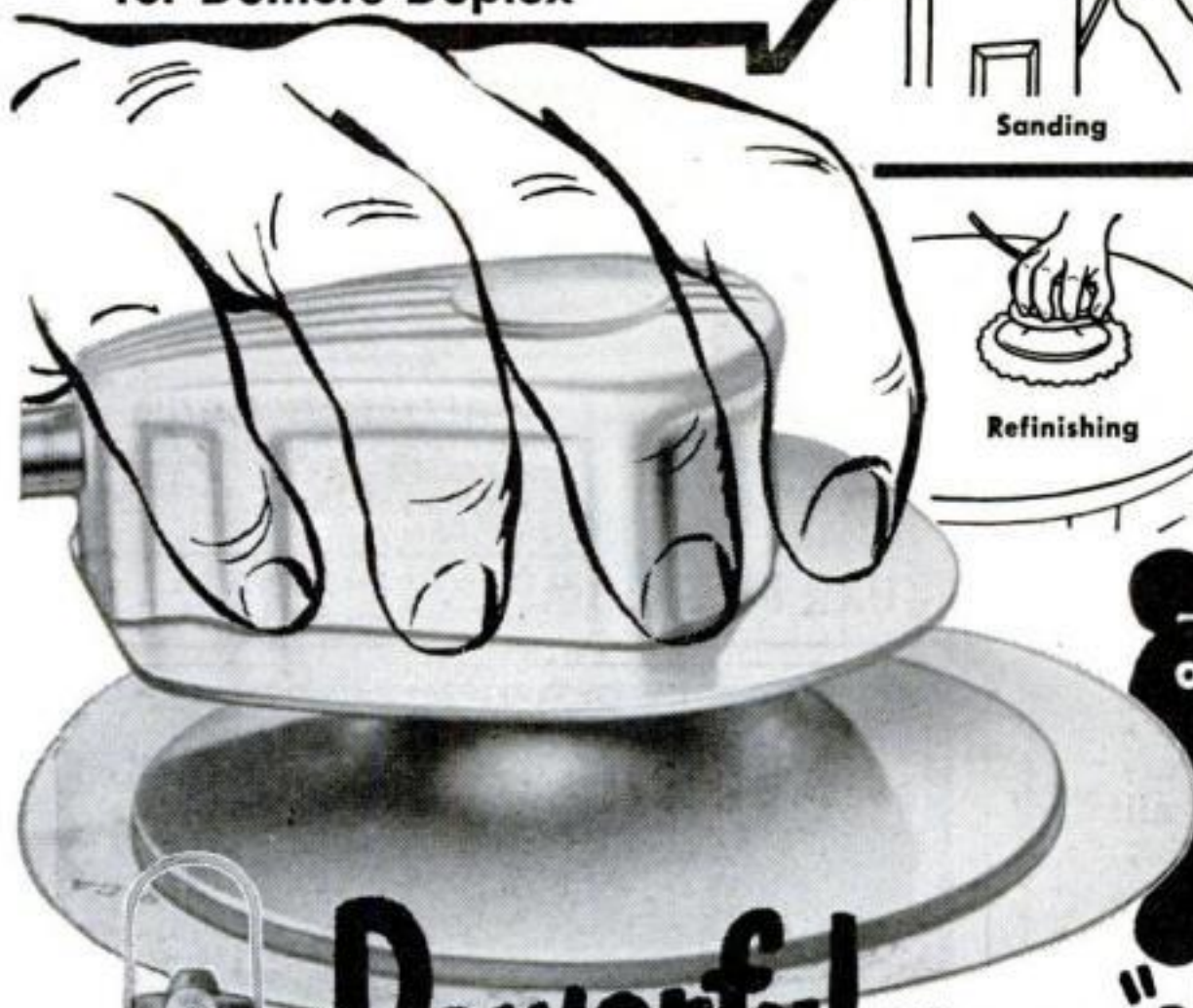
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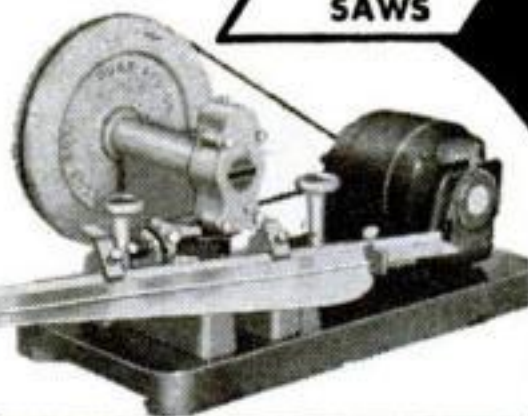
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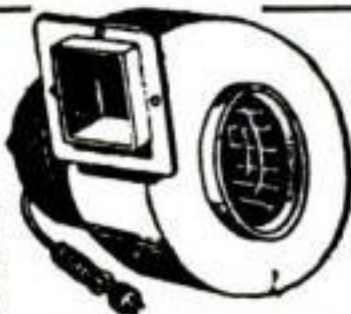
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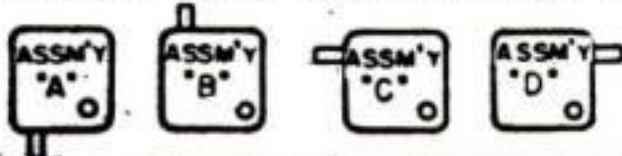


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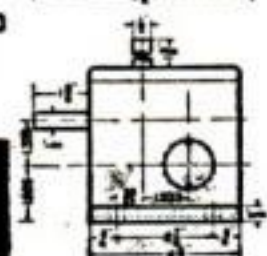
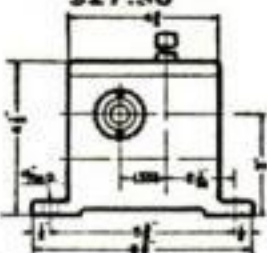
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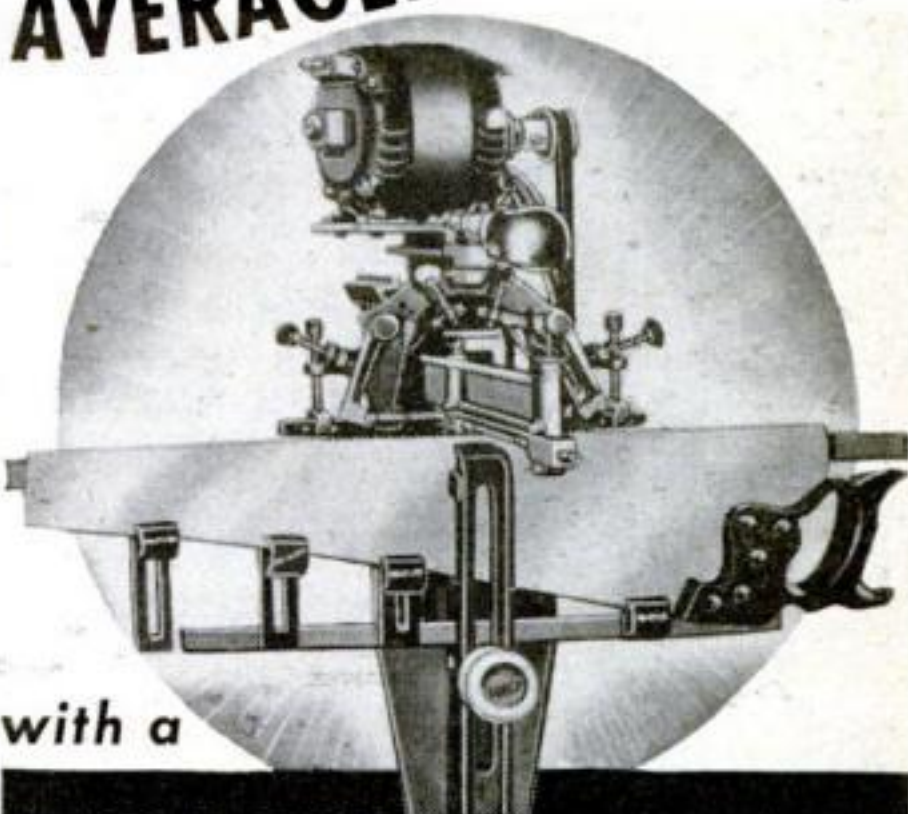


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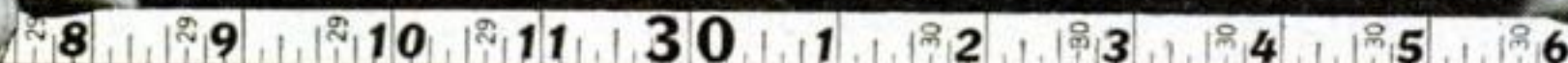
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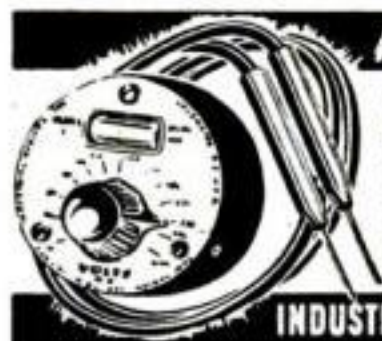
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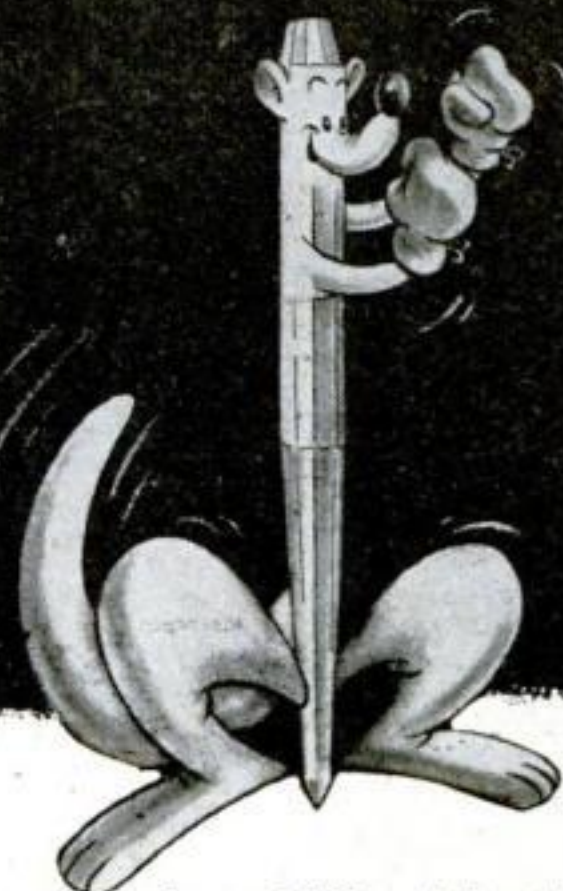
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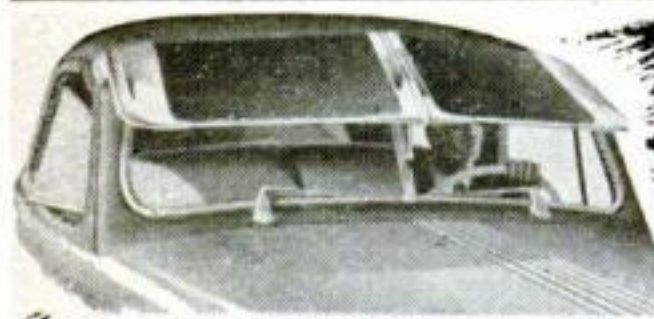
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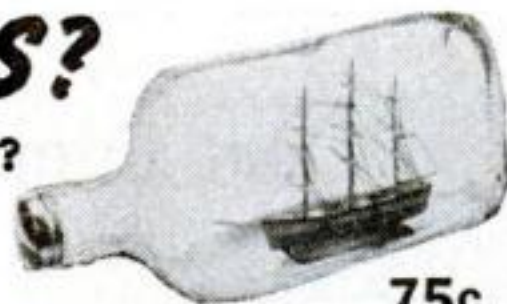
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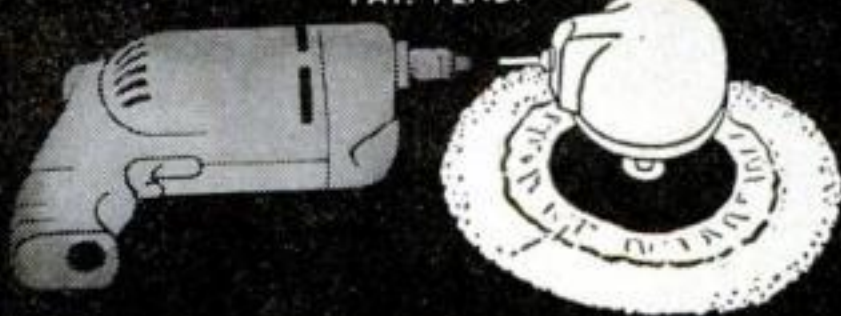
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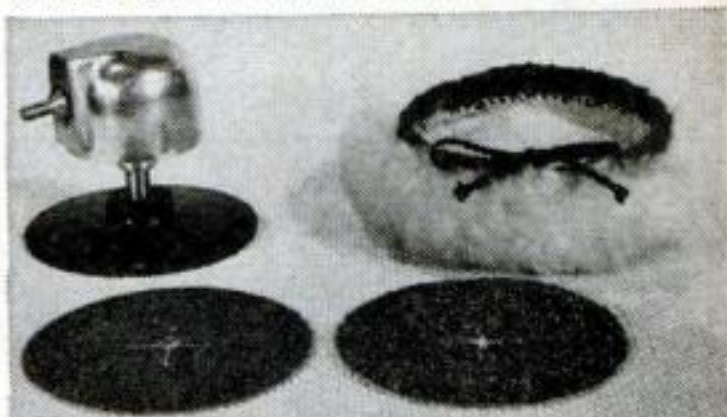


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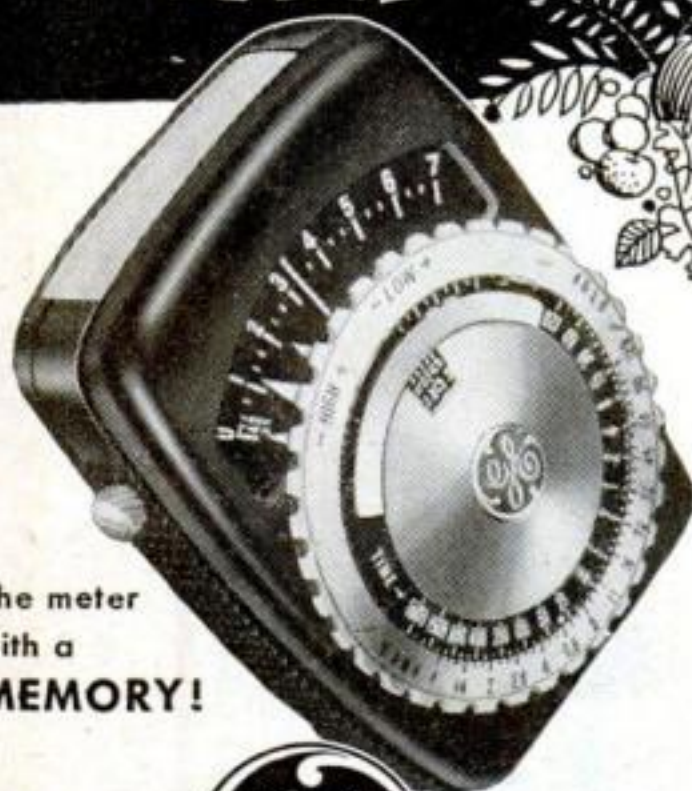
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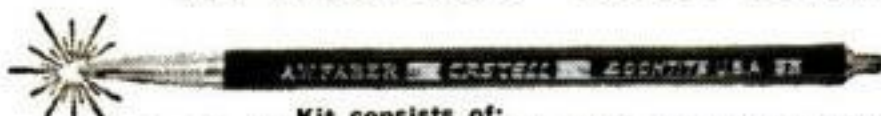
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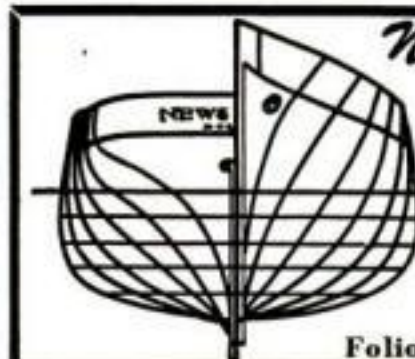
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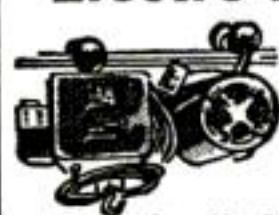
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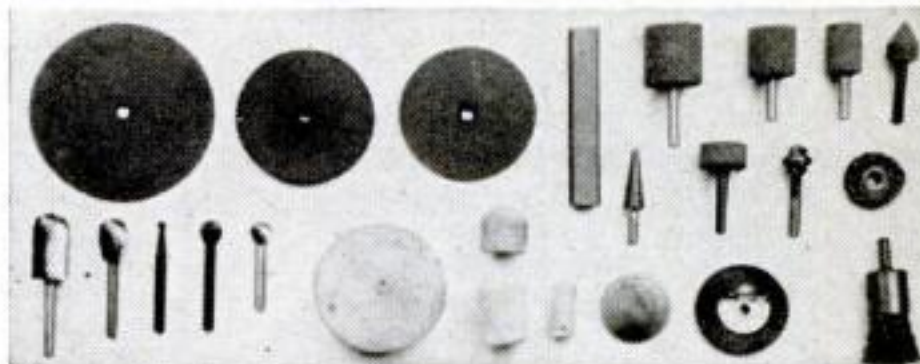
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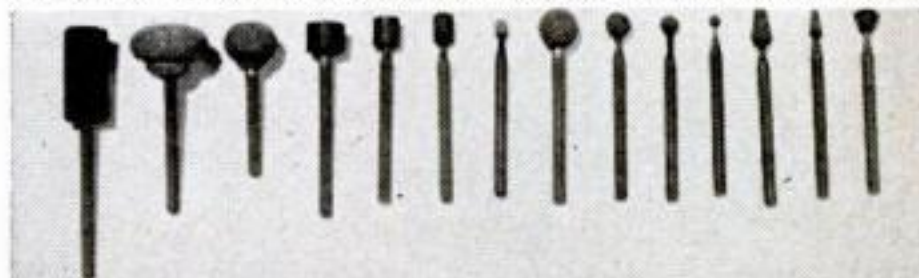


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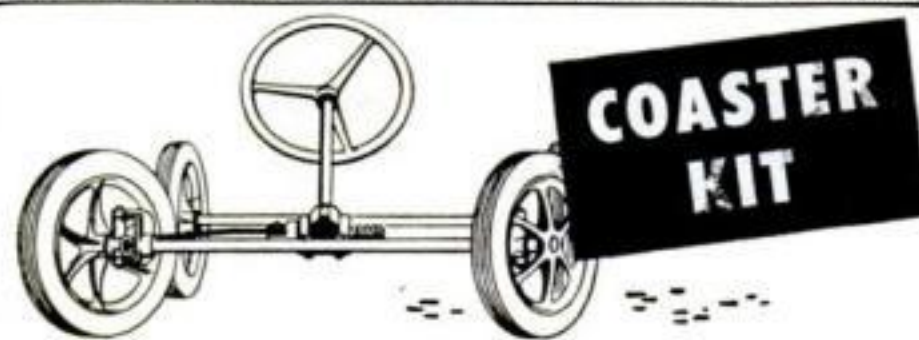
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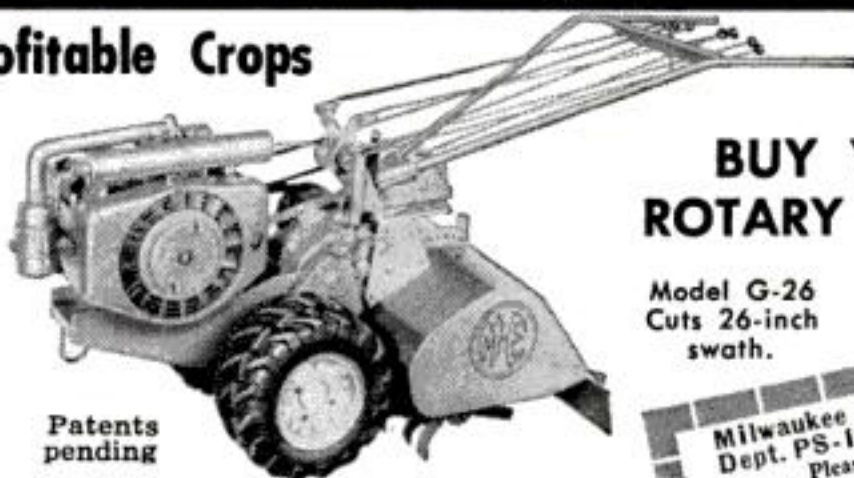


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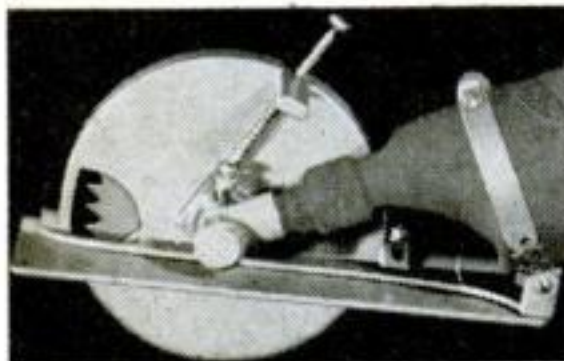
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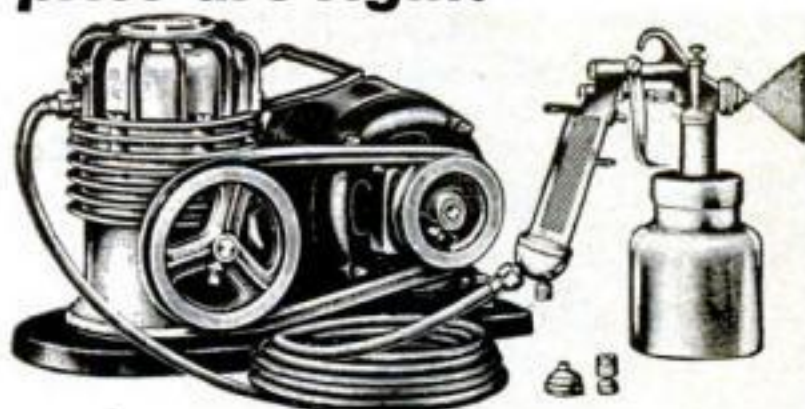
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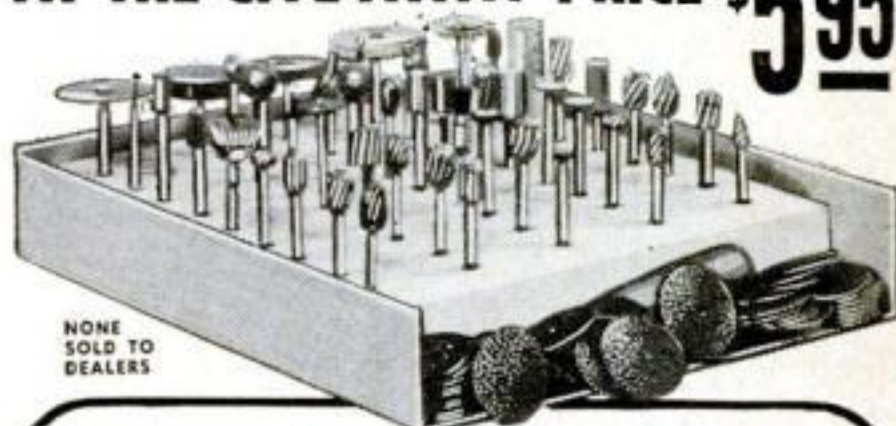
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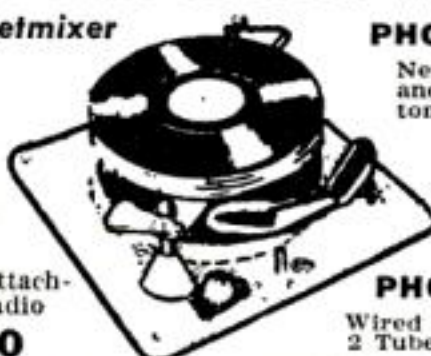
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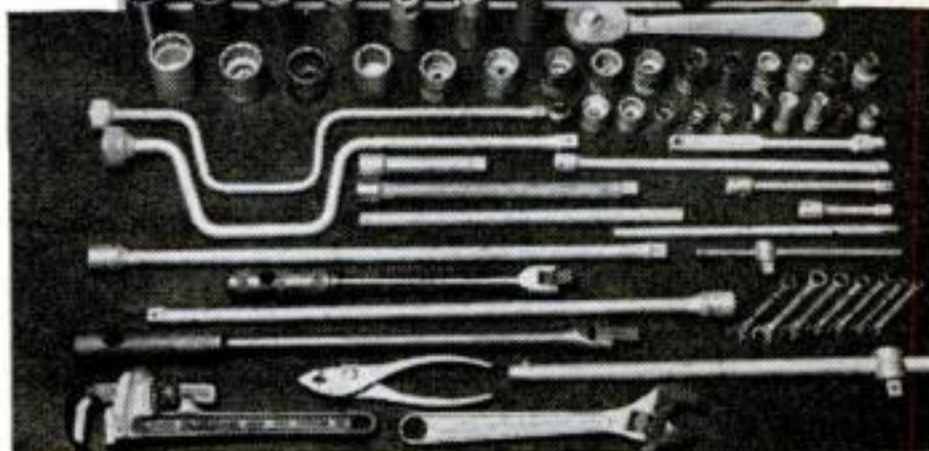
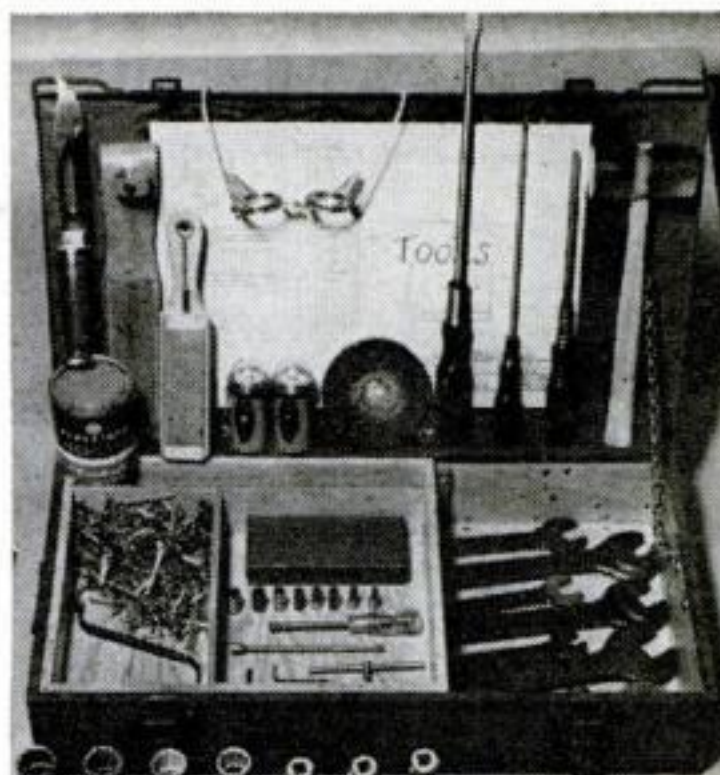


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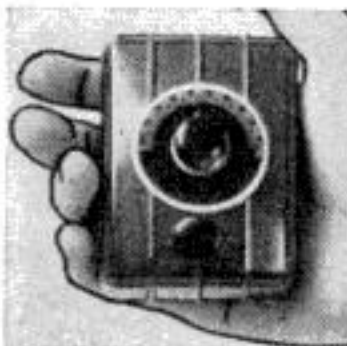
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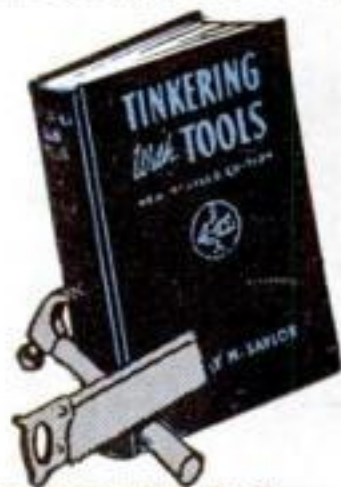
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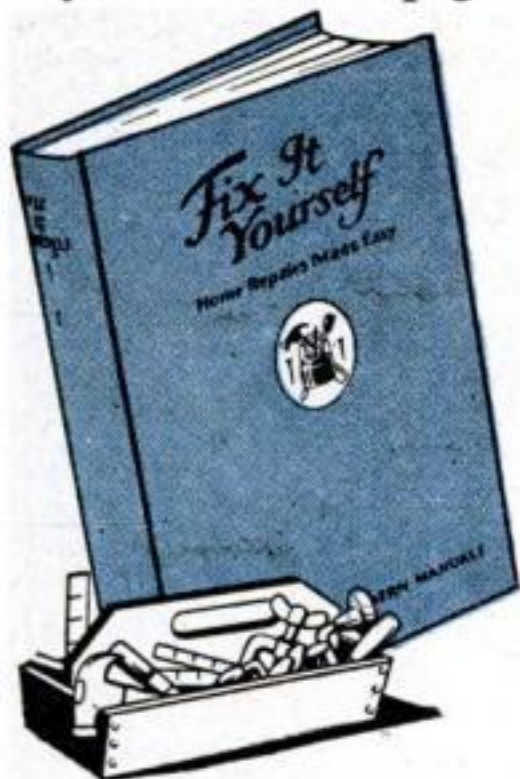
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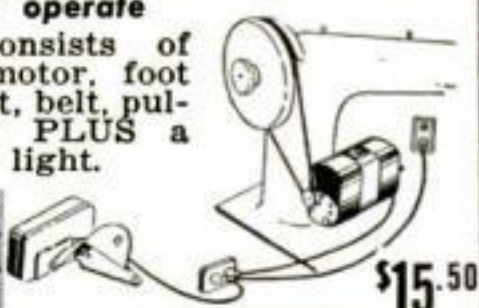
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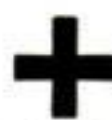
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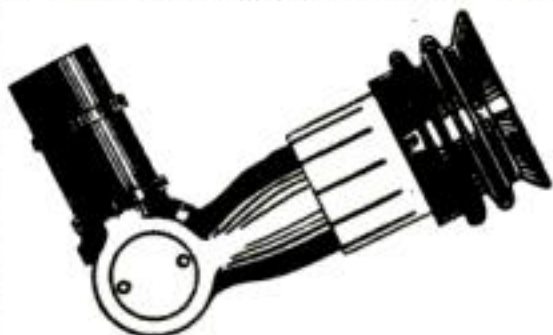
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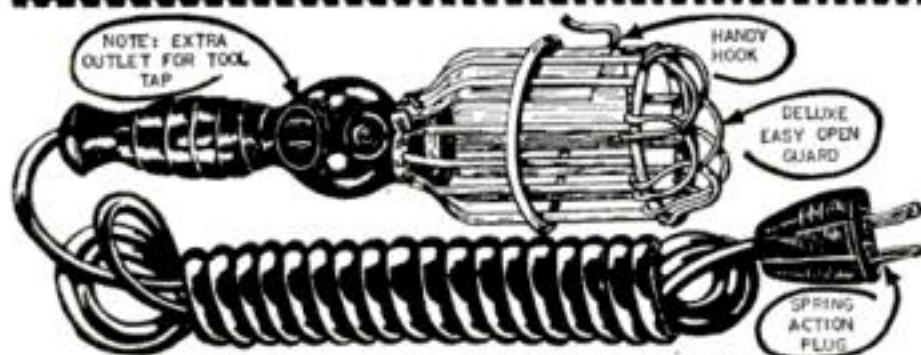
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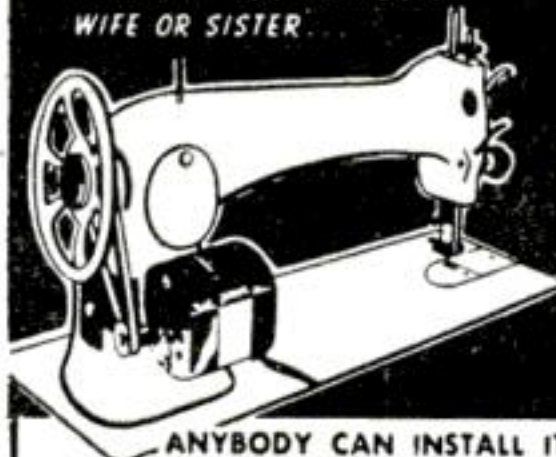
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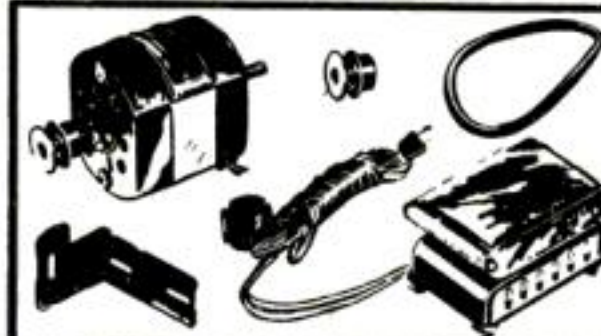
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OCTOBER 1948 309

REMINDER

(Courtesy Mother Nature.)

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It's a reminder that should make you think, seriously, that you yourself are a year closer to the autumn of your own particular life.

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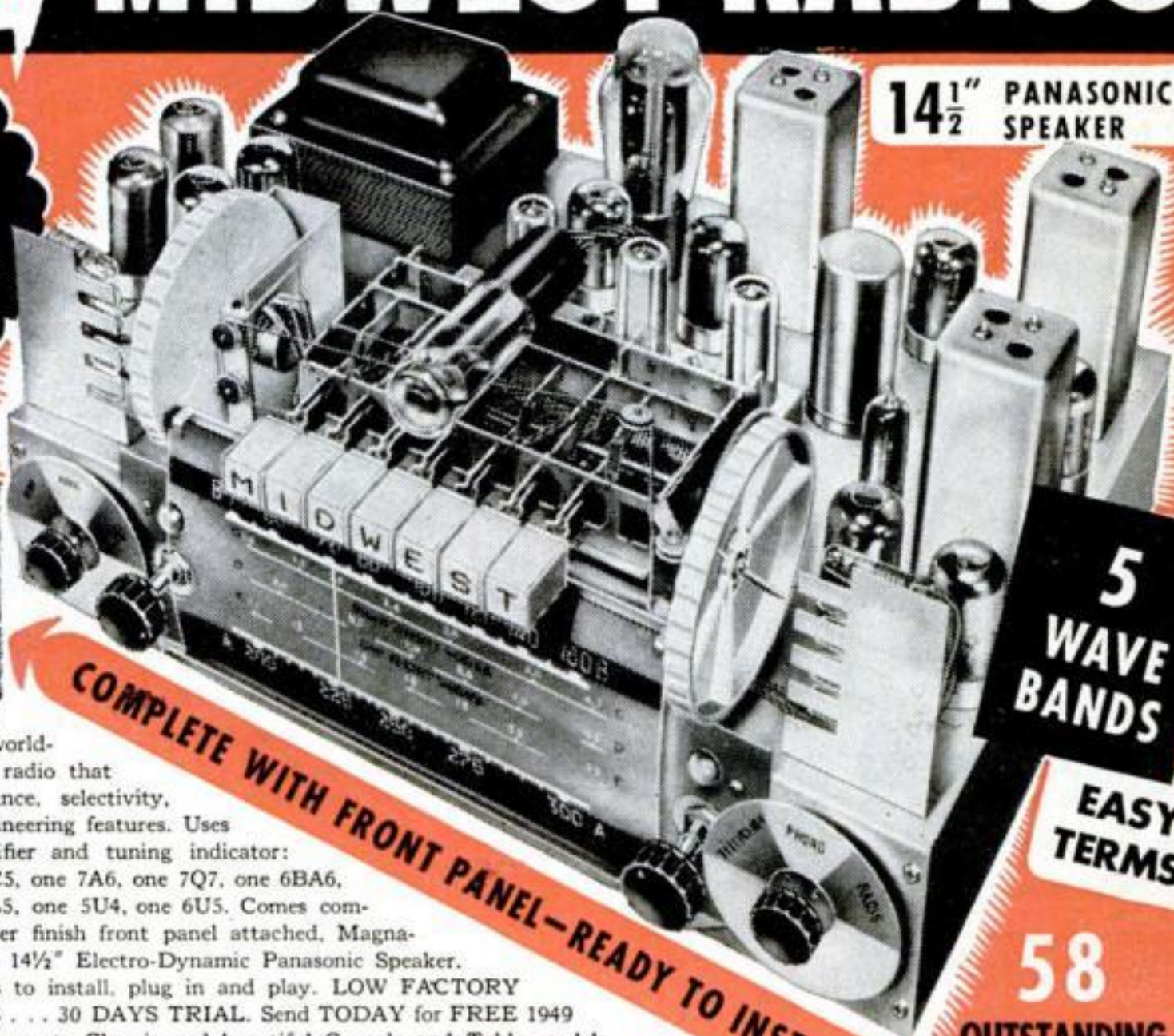


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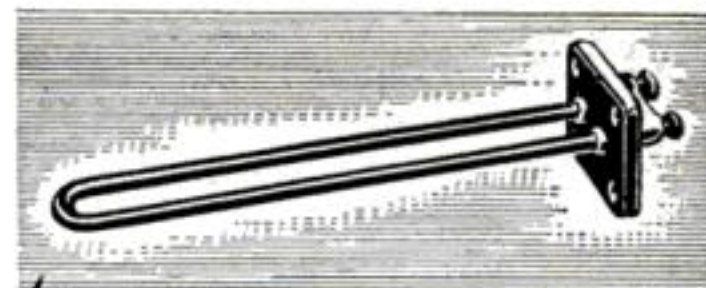
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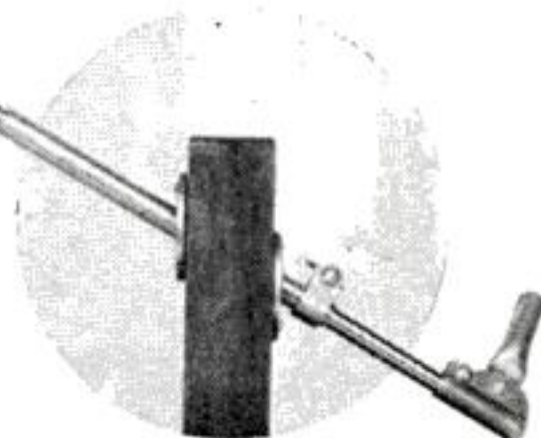
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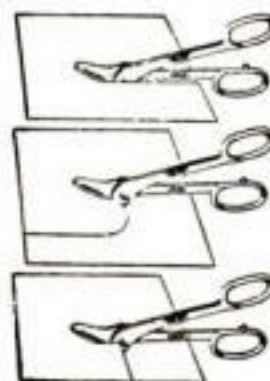


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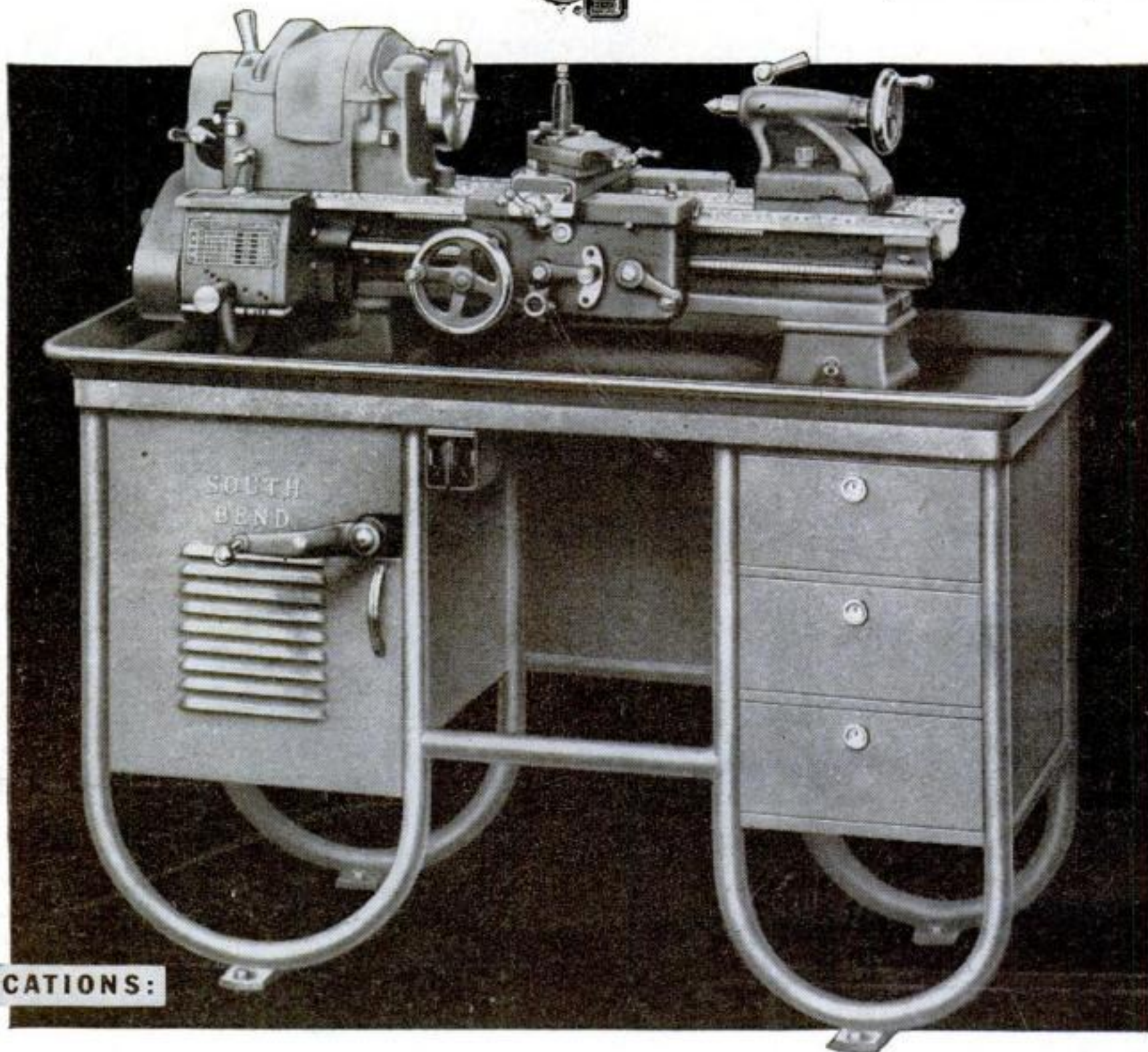
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COLLET CAPACITY 1 inch

SPINDLE BORE 1 $\frac{3}{8}$ inches

12 SPINDLE SPEEDS . . 50 to 1357 r.p.m.

CROSS SLIDE TRAVEL 5 $\frac{1}{8}$ "

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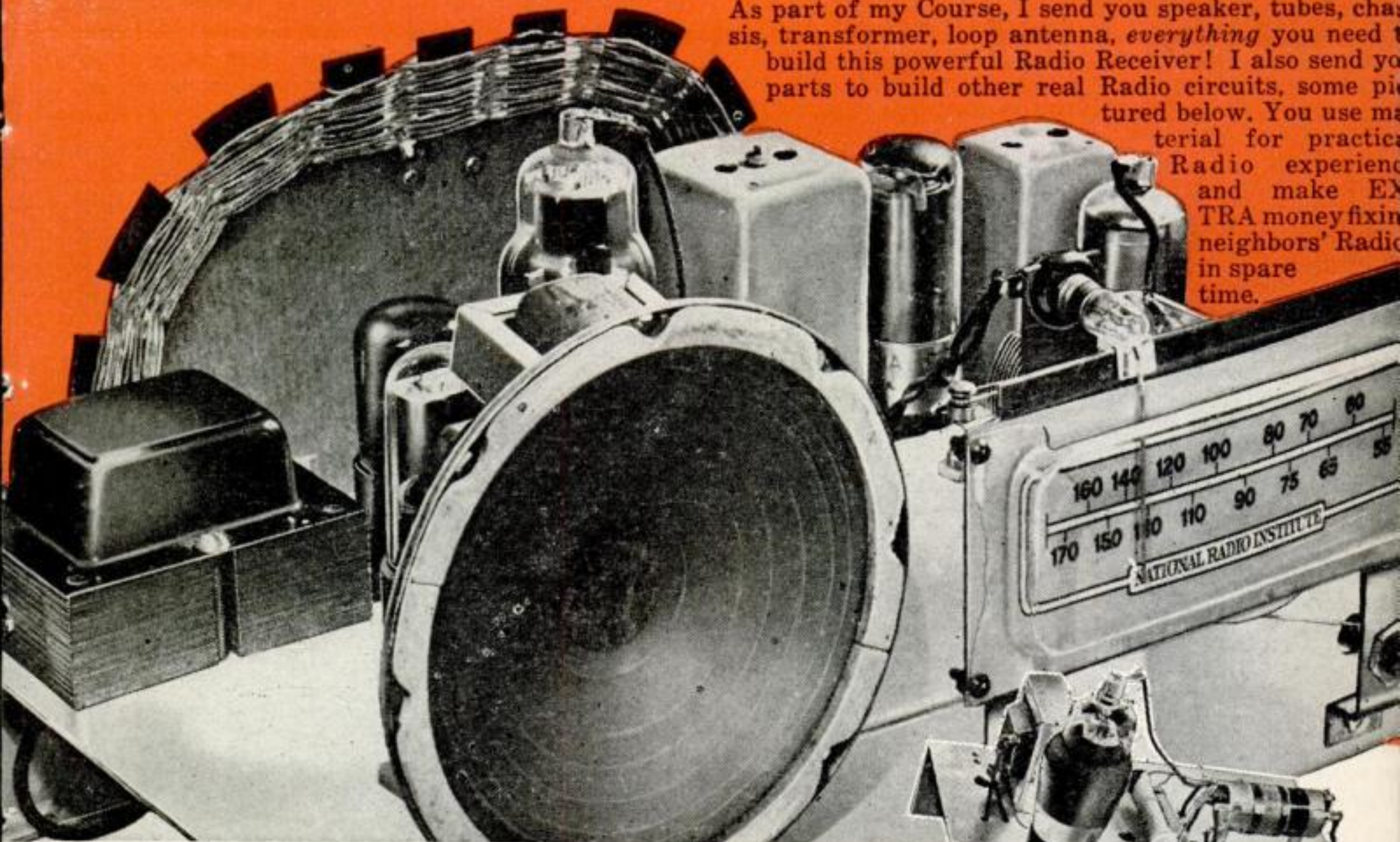
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